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Dissemination of cognitive behavioral therapy in Japan from FY2010 to FY2015: a descriptive study using the nationwide claims database

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Dissemination of cognitive behavioral therapy in Japan from FY2010 to FY2015: a descriptive study using the nationwide claims database

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ABSTRACT

Objectives: To clarify the dissemination status of cognitive behavioral therapy (CBT) in Japan under the national health insurance scheme.

Design: Retrospective observational study.

Setting: National Database of Health Insurance Claims and Specific Health Checkups of Japan.

Participants: Patients who received CBT under the national health insurance scheme from FY2010 to FY2015.

Primary and secondary outcome measures: We estimated the change rate and the standardized claim ratio (SCR) for the number of patients receiving CBT and analyzed the association between the CBT status and several regional factors.

Results: We found that: (a) a total of 60304 patients received CBT during the study period; (b) the number of patients receiving CBT was highest in the first year (-1.8% from FY2010 to FY2015); (c) the number of patients who received CBT per 100000 population decreased (or remained at zero) in most prefectures (32 out of 47); (d) there was a maximum 424.7-fold difference between prefectures in standardized claim ratio for CBT; (e) the number of registered CBT institutions was significantly associated with the number of patients who received CBT.

Conclusions: The provision of CBT did not increase in the first six years (FY2010–2015) after its coverage in Japan's national health insurance scheme. Further studies including a questionnaire survey of registered CBT institutions are required to get more detailed information on the dissemination of CBT in Japan.

Strengths and limitations of this study:

- This is the first study to describe in the provision status of cognitive behavioral therapy (CBT) in Japan using a nationwide database which covers all electronic claims in Japan's national health insurance system.
- The main limitation of this study is that our data does not include medical treatment data for any treatment provided outside the national system (e.g. private counseling).
- Our ecological analysis was conducted using specific variables, so there could be other factors which affect the provision of CBT.

INTRODUCTION

Disseminating effective treatment for psychiatric disorders is urgently required around the world. Mathers and Loncar[1] reported that major depression is predicted to be the leading cause of burden of disease in high-income countries by 2030; HIV/AIDS and perinatal disorders rank higher only in low-income and middle-income countries.

Since the 1980s, effective psychological interventions for a wide range of psychiatric disorders have been empirically developed. Among them, cognitive behavioral therapy (CBT) has consistently been shown to be effective for various psychiatric disorders on both a short- and long-term basis,[2-10] and has also been a strongly recommended treatment option in some national guidelines.[11-15] Importantly, patients often desire to receive psychotherapy rather than pharmacotherapy.[16 17] However, there is evidence that empirically supported CBT is rarely available (or is delivered suboptimally) in routine clinical care in Western countries.[18 19]

In Japan, CBT was introduced to the psychiatric field in the late 1980s,[20] and has been covered by the national health insurance scheme since FY2010. This marked a milestone in Japanese mental health service where pharmacotherapy has historically been much more common.[21-23] Subsequently, since FY2011, the Japanese Ministry

of Health Labor and Welfare (MHLW) has started to organize training for therapists to disseminate CBT. However, it is still unclear whether CBT is routinely implemented in Japanese clinical settings under the national health insurance scheme. Two studies have employed a questionnaire method to investigate the capability of providing CBT in Japanese psychiatric institutions, but the very low return/response rates (16.5% and 20.3%) limit the generalizability of the findings.[24 25]

The current study aims to assess the dissemination status of CBT in the first six years (FY2010–2015) after its inclusion in the national insurance scheme in Japan, using the nationwide claims database. Data on the actual dissemination status of CBT (including regional variations) has never been widely available, and such data is needed to estimate the unmet need for services, to promote open discussion between policy makers and general public, and to guide mental health care policy initiatives in the future.

METHODS

Main data source and extracted data

The present descriptive study was conducted using data from the National Database of Health Insurance Claims and Specific Health Checkups of Japan (NDB), a Japanese

nationwide health insurance claims database operated by the MHLW. Japan utilizes a universal healthcare system (see online supplementary figure 1), and the NDB has all electronic claims, 99% of all claims issued from hospitals and clinics,[26] and stores approximately 1.9 billion claims annually. The claims data contains various clinical and procedural information, such as patients' sex, age, month of examination, diagnostic code, medical practice code, drug code, and hospital code. Personally identifiable data (e.g. name, beneficiary identification number, date of birth) are automatically converted into hash values at the time of storage in NDB to make it irreversibly anonymous.

We used accumulated NDB data from FY2010 to FY2015 regarding CBT [code 180035910 and 180033210]. We also collected NDB data regarding ambulatory psychotherapy as a reference (≥ 30 minutes [code 180012210] and < 30 minutes [code 180031010]). Ambulatory psychotherapy in the national health insurance scheme includes any type of medical examination (e.g. supportive psychotherapy) implemented by psychiatrists in routine outpatient care. We chose this as a reference to CBT because: (1) both psychotherapies target only outpatients, and (2) both are provided only by a medical doctor (table 1). Extracted NDB data provided the exact number of patients who received each psychotherapy in each age group and prefecture. Each patient was counted as "one" even though the patient received more than one session. We did not

collect diagnostic codes because it is said that diagnostic codes in NDB do not reflect the actual patient's diagnosis due to insurance claims needs.[27] To address the uncertainty/inaccuracy of diagnostic codes in NDB, some studies have combined diagnostic codes with other reliable examination or treatment codes (e.g. breast cancer code + cancer treatment codes [surgery/chemotherapy/medication/radiation procedure]).[28] However, in the psychiatric field, diagnostic codes in NDB are usually based on clinicians' own judgement, and there are no other reliable examination or treatment codes to determine specific disorders. Therefore, we only focused on reliable medical practice codes in this study.

Table 1. CBT and ambulatory psychotherapy in Japan's national health insurance scheme

	CBT		Ambulatory psychotherapy	
	CBT(1) [a]	CBT(2)	≥ 30 min	< 30 min
Code	180035910	180033210	180012210	180031010
Time	> 30min		≥ 30 min	5-30 min
Provider	trained designated psychiatrist [b, c]	trained psychiatrist /clinician [b]	any psychiatrist	
Target	only mood disorder		any psychiatric disorder	
Institutional registration	+ [d]		-	

Medical fees per session (JPY)	5000	4200	4000	3300
Maximum of medical fees per hour (JPY)	10000	8400	8000	23100 [e]

[a] CBT(1) have been established since FY2012.

[b] who received some kind of any training for CBT.

[c] Designated psychiatrist (Mental Health and Welfare Law-authorized) who also cooperates with local psychiatric emergency medical services (e.g. holiday/night medical examinations).

[d] Institutions need to register their institution's name along with CBT providers names (trained designated psychiatrists or trained psychiatrists/clinicians) to the Regional Bureau of Health and Welfare of Japan.

[e] assuming that a psychiatrist sees 7 patients per hour.[29]

CBT, cognitive behavioral therapy.

Analysis

Firstly, we calculated the change rate for the number of patients who received CBT or ambulatory psychotherapy from FY2010 through FY2015. A baseline for the rate of change for each psychotherapy was the number of patients in FY2010. Secondly, we

calculated the number of patients who received each psychotherapy per 100000 population, and then assessed the increase or decrease in patients between FY2010 and FY2015 by prefecture. Thirdly, we calculated the standardized claim ratio (SCR) for the number of patients who received CBT. The indicator is based on the same logic as the standardized mortality ratio (e.g. it signifies that a prefecture with an SCR over 100 has more patients who received CBT than the national mean). The SCR is calculated according to the following formula;

$$\begin{aligned} \mathrm{SCR} &= \frac{\Sigma\ \text{Observed number (N) of claims}}{\Sigma\ \text{Expected N of claims}} \times 100 \\ &= \frac{\Sigma\ \text{Observed N of claims by age group} \times 100}{\Sigma\ \text{Population by age group} \times \text{Claim rate by age group}} \\ &= \frac{\Sigma\ \text{Observed N of claims by age group} \times 100}{\Sigma\ \text{Population by age group} \times \dfrac{\text{Observed N of claims by age group in Japan}}{\text{Population by age group in Japan}}} \end{aligned}$$

Fourthly, in order to assess regional factors related to the provision of CBT, we examined associations between CBT patients per 100000 population and the following variables: (1) registered institutions for CBT per 100000 population from Regional Bureau of Health and Welfare of Japan; (2) psychiatrists per 100000 population from the portal site for Japanese Government Statistics, by using linear mixed effects models. Fixed effects were the above three variables and year; prefecture was included as a random effect. We also investigated the association between SCR for CBT and the implementation of formal CBT training (organized by the MHLW) using independent t-

test. The dependent variable was SCR for CBT, and the independent variables were prefecture groups that had been classified according to whether or not formal CBT training had been implemented (at least 1 time). P values < 0.05 were considered to indicate significant differences. Data were analyzed using the SAS software ver. 9.4 (SAS Institute Inc., Cary, NC, USA).

Patient and public involvement

Patients or public were not involved in this study.

Results

During the study period (FY2010–2015), 60304 patients received CBT and 34628225 patients received ambulatory psychotherapy. There is no big difference in terms of demographic data between these psychotherapies: more females than males received each psychotherapy, with most patients (male and female) being aged between 20–59 (see online supplementary table 1). As for trends over time (figure 1), the number of patients who received CBT dropped in FY2012 and thereafter recovered slightly from FY2013, but not to the level of FY2010 (when CBT was first added to the health insurance scheme). CBT patients decreased by 1.8% from FY2010 to FY2015. In

contrast, the number of patients who received both types of ambulatory psychotherapy continued to increase; of these, ambulatory psychotherapy (≥ 30 min) increased dramatically from FY2012.

[Insert figure 1 about here]

At the prefectural level, from FY2010 to FY2015, patients receiving CBT per 100000 population decreased (or remained at zero) in 32 of 47 prefectures, whereas patients receiving ambulatory psychotherapy per 100000 population increased in all prefectures. Figure 2 shows the SCR for the number of patients who received each psychotherapy in the study period. There was a maximum 424.7-fold difference in SCR between the highest (SCR = 585.2 in Ishikawa) and lowest (SCR = 1.4 in Tokushima) prefectures. Meanwhile, there was a maximum 3.4-fold difference in SCR of ambulatory psychotherapy (see online supplementary table 2).

[Insert figure 2 about here]

In terms of the relationship between regional factors and the provision of CBT, the number of patients who received CBT per 100000 population was associated significantly with the number of registered CBT institutions per 100000 population ($p < 0.01$) (table 2). If the number of registered institutions per 100000 population increased by one, the number of patients increased by 23.1 (standard error = 3.4) patients per

100000 population. The other factors were not associated with the number of CBT patients per 100000 population or SCR for CBT (table 2 and 3).

Table 2. Results of ecological analysis on factors associated with number of patients who received CBT per 100000 population (FY2010–2015)

		Estimate	Standard error	Degree of freedom	T value	P value
Number of registered CBT institutions per 100 000 population	Intercept	-5.0	2.6	46	-1.9	0.06
	Slope	23.1	3.4	137	6.7	< 0.01*
Number of psychiatrists per 100 000 population	Intercept	4.4	5.9	46	0.7	0.46
	Slope	0.3	0.4	91	0.6	0.52

* indicates significant difference.

CBT, cognitive behavioral therapy.

Table 3. Association between implementation of formal CBT training and SCR for CBT (FY2010–FY2015)

	Training [-]	Training [+]	P value
Prefectures (n)	37	10	-
SCR for CBT (Mean ± SE)	98.0 ± 23.0	73.2 ± 19.9	0.59

Degree of freedom = 45, t value = 0.54.

CBT, cognitive behavioral therapy; SCR, standardized claim ratio.

DISCUSSION

This is the first study to use the nationwide claim database to demonstrate in detail the provision status of CBT in Japan in the first six years (FY2010–2015) after its inclusion in the national health insurance scheme. Our results show that: (a) approximately 60000 patients received CBT during the study period; (b) the number of patients receiving CBT was highest in the first year (-1.8% from FY2010 to FY2015), whereas ambulatory psychotherapies continued to increase over six years (+121.3% [≥ 30 min] and +17.7% [< 30 min] from FY2010 to FY2015); (c) the number of patients receiving CBT per 100000 decreased (or remained at zero) in most prefectures (32 out of 47); (d) based on SCR, there was a maximum 420-fold regional difference in the number of CBT patients between prefectures; (e) the number of registered CBT institutions was significantly associated with the number of patients receiving CBT. Overall, the current study indicates that the provision of CBT did not increase under Japan's health insurance scheme from FY2010 to FY2015.

The reasons that the provision of CBT reached a plateau in Japan could be due to strict requirements and low medical fees for therapists/institutions in the national health insurance system. For example, a CBT provider must be a medical doctor, must target only mood disorders, and the provider's institution must be registered to the Regional Bureau of Health and Welfare of Japan (table 1). Because CBT is only allowed to treat mood disorders, one would reasonably expect ambulatory psychotherapy to be provided at a higher rate than CBT. In terms of medical fees, CBT fees in Japan are substantially lower than those in Western countries (e.g. Japan, maximum 5000 JPY per session; in contrast, in the UK, 97 GBP [equal to 14550 JPY] per session[30]). Moreover, CBT fees are almost the same as ambulatory psychotherapy fees for sessions over 30 minutes despite the aforementioned restrictions (table 1). Thus, ambulatory psychotherapy sessions under 30 minutes yield the highest profits for clinicians in Japan's national health insurance system. Indeed, Japanese psychiatrists see 7 outpatients per hour in routine clinical practice.[29] Furthermore, some studies have reported that the main obstacles in providing psychotherapy/CBT in Japan are a lack of time and profitability.[24 25] Thus, more reasonable medical fees and requirements suitable to the actual conditions of routine clinical practice could motivate the use of CBT under the national health insurance scheme in Japan.

This study focused on CBT but a large shift in ambulatory psychotherapy (≥ 30 min) in FY2012 should be addressed. It seems that this large shift was caused by the revision of medical fee requirements for ambulatory psychotherapy in that year. Before the revision in FY2012, psychiatrists at any psychiatric institution were able to claim one type of ambulatory psychotherapy when they spent more than 60 minutes with a patient for the first visit. However, the revision imposed cooperation with local psychiatric emergency medical services (e.g. holiday/night medical examinations) on psychiatrist for this type of ambulatory psychotherapy. Because of this, many psychiatrists (especially those working at small psychiatric institutions) were no longer able to claim the optional fees for ambulatory psychotherapy applied on the first visit. As a result, it is possible that psychiatrists started claiming outpatients in the first visit as covered by "ambulatory psychotherapy (≥ 30 min)".

Our results also showed a maximum approximately 420-fold difference in SCR for CBT between prefectures, and a maximum 3.4-fold difference in SCR for ambulatory psychotherapy. Namely, there was a large regional variation in CBT utilization. In particular, SCR was low over the whole Tohoku region where effective treatment for psychiatric disorders is in high demand because of the high suicide rate.[31] In contrast, SCR in some prefectures (e.g. Ishikawa, Shimane, Gifu, Okayama,

Kumamoto) was noticeably high. Investigation into CBT efforts in these areas would be helpful to fill in the gaps in regional variations in providing CBT. On the other hand, one of the reasons for the large variation in SCR between prefectures may be that the total number of CBT patients in Japan is small. Therefore, if a single institution in a particular prefecture has many CBT patients, the SCR in that area would be overestimated because it is an indicator calculated from the national mean.

During the study period, formal CBT training had been implemented in 10 out of 47 prefectures. We predicted that the implementation of formal CBT training would be associated with SCR for CBT, but there was no association between these variables. The training consists of a two-day onsite workshop and continuous online clinical supervision. Thus, one of the reasons that clinicians in regions with no workshop training can continue to provide CBT may be because they can receive continuous online supervised instruction irrespective of area. There was also a significant association between the number of CBT patients per 100000 population and the number of registered CBT institutions per 100000 population. These results suggest that an increase in institutions that have formally-trained clinicians and that meet institutional criteria for CBT could lead to a wide-scale dissemination of CBT under the national health insurance scheme.

In order to make CBT much more widely available, recent success in the UK also offer lessons that are likely applicable to Japan. The UK government has instigated a therapists' post-qualification training program, the English Improving Access to Psychological Therapies (IAPT). Since the start of the IAPT in 2008, the number of patients who receive psychotherapy in the UK has increased (over 560000 patients received a course of treatment in 2017).[32] Because both the UK and Japan have a universal healthcare system, such financial and logistical supports from health care policymakers are crucial for a wide-scale implementation of CBT in Japan.

The strength of this study is that the data source was the NDB, a comprehensive database which covers all electronic claims in Japan's national health insurance system. However, there are also several limitations. First, the NDB does not store medical treatment data for any treatment provided outside the national system (e.g. private counseling). Although CBT for depression in Japan is mainly provided by psychologists in routine care,[33] it is not covered by the national health insurance system. Thus, there is a possibility that more CBT was actually conducted across Japan, even in prefectures with few CBT patients under the health insurance scheme. Second, we selected ambulatory psychotherapy as a reference to CBT because both psychotherapies target only outpatients and both are provided only by a medical doctor.

However, this is still not an ideal reference because the provider and target of both psychotherapies are not perfect analogs. Third, our ecological analysis was conducted using specific variables. There could be other factors which affect the provision of CBT. Because of these limitations, a further questionnaire survey of registered CBT institutions is required.

Overall, our current study revealed some issues regarding the provision of CBT in Japan in the first six years (FY2010–FY2015) after its coverage in the national health insurance scheme. The number of patients receiving CBT in Japan did not increase probably due to unprofitability for therapists/institutions in Japan's current healthcare insurance system. Further, there were large regional variations in CBT status between the 47 prefectures and a significant association between the number of CBT patients per 100000 population and the number of registered CBT institutions per 100000 population. These findings suggest that an appropriate evaluation of medical fees for CBT in clinical settings and supporting hospitals and/or clinics in meeting the institutional criteria for CBT would help in the widespread utilization of CBT in Japan. Further research into the status of CBT in Japan after the observation period of this study (FY2016–) and a questionnaire survey of registered CBT institutions are required to get more detailed information on the dissemination of CBT.

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Patients consent for publication: Not required.

Ethics approval: The study protocol was reviewed and approved by the Ethics Committee of the University of Miyazaki (reference number: O-0017). We also got permission to use a dataset extracted from the NDB (reference number: 1025-1). Written informed consent was waived because all patient records were automatically anonymized prior to storage in NDB (i.e. no one can identify specific patients).

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Figure legends:

Figure 1. Trends over time for the number of outpatients who received psychotherapy in Japan.

Figure 2. Geographical distribution of standardized claim ratio (SCR) for the number of outpatients who received psychotherapy in Japan from FY2010 to FY2015. The color bar shows a degree of SCR. SCR of 100 indicates the national mean.

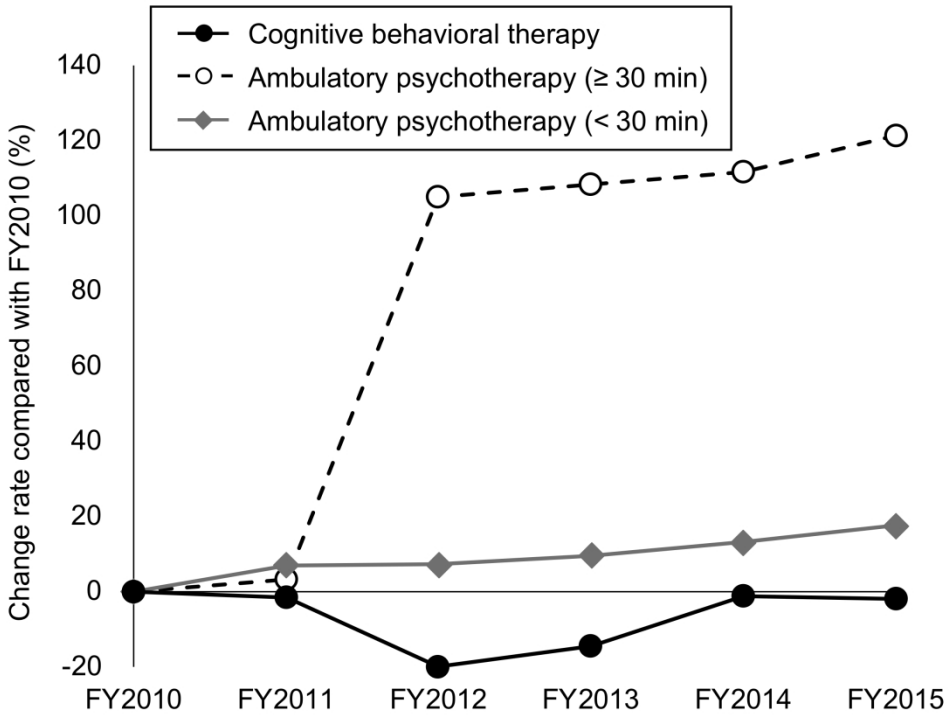


Figure 1. Trends over time for the number of outpatients who received psychotherapy in Japan. FY, fiscal year.

254x190mm (300 x 300 DPI)

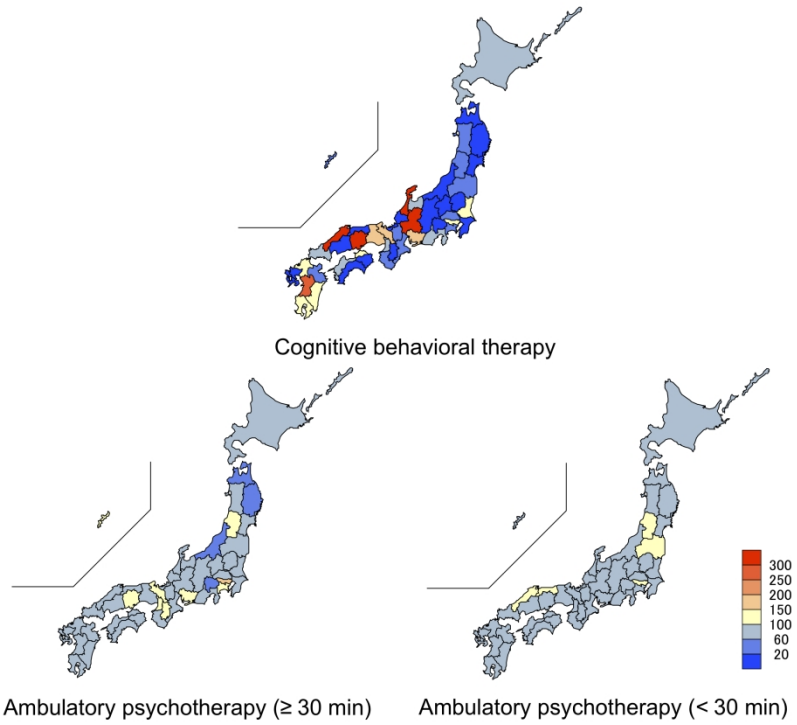
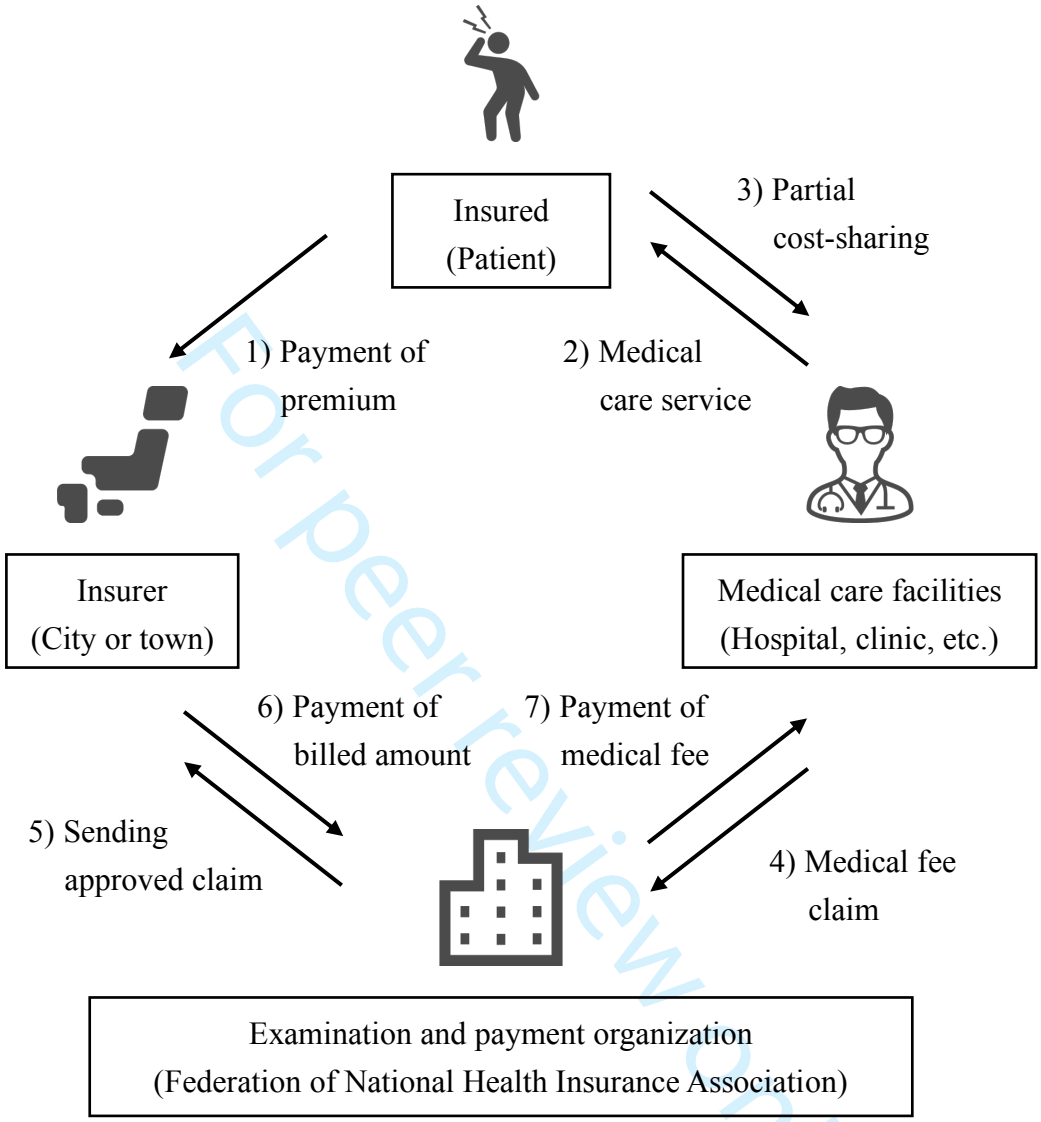


Figure 2. Geographical distribution of standardized claim ratio (SCR) for the number of outpatients who received psychotherapy in Japan from fiscal years 2010 to 2015. The color bar shows a degree of SCR. SCR of 100 indicates the national mean.

254x190mm (300 x 300 DPI)

Supplementary Figure 1. Overview of Japan's universal healthcare system



Supplementary Table 1. Demographic data of outpatients who received each psychotherapies by sex and age groups

	FY2010						FY2011					
	CBT	%	Ambulatory psychotherapy				CBT	%	Ambulatory psychotherapy			
			≥ 30 min	%	< 30 min	%			≥ 30 min	%	< 30 min	%
Male (years)	3911	34.9	266900	40.4	1979923	42.6	3896	35.5	279000	40.8	2135354	42.9
0-9	13	0.1	24510	3.7	34028	0.7	87	0.8	26480	3.9	37825	0.8
10-19	135	1.2	33955	5.1	85966	1.9	230	2.1	35715	5.2	95109	1.9
20-29	660	5.9	39449	6.0	231457	5.0	648	5.9	41733	6.1	242586	4.9
30-39	1027	9.2	52128	7.9	429146	9.2	931	8.5	52961	7.8	447328	9.0
40-49	900	8.0	43379	6.6	418062	9.0	821	7.5	45867	6.7	457105	9.2
50-59	451	4.0	25776	3.9	298054	6.4	426	3.9	26776	3.9	321345	6.5
60-69	304	2.7	18412	2.8	225926	4.9	270	2.5	18563	2.7	252745	5.1
70-79	233	2.1	17154	2.6	165747	3.6	254	2.3	17855	2.6	180096	3.6
≥ 80	188	1.7	12137	1.8	91537	2.0	229	2.1	13050	1.9	101215	2.0
Female (years)	7285	65.1	393585	59.6	2662976	57.4	7084	64.5	404249	59.2	2839696	57.1
0-9	-*	-*	8532	1.3	11131	0.2	27	0.2	9415	1.4	12570	0.3
10-19	240	2.1	35604	5.4	90061	1.9	314	2.9	35701	5.2	92282	1.9
20-29	1435	12.8	73045	11.1	349509	7.5	1475	13.4	73823	10.8	356484	7.2
30-39	1821	16.3	82301	12.5	496888	10.7	1684	15.3	82397	12.1	515329	10.4
40-49	1317	11.8	59671	9.0	432489	9.3	1187	10.8	63124	9.2	471593	9.5
50-59	745	6.7	37629	5.7	341547	7.4	640	5.8	38391	5.6	360082	7.2
60-69	596	5.3	33855	5.1	362120	7.8	570	5.2	34571	5.1	400893	8.1
70-79	607	5.4	34972	5.3	337177	7.3	573	5.2	36171	5.3	363038	7.3
≧80	524	4.7	27976	4.2	242054	5.2	614	5.6	30656	4.5	267425	5.4
Total	11196	100.0	660485	100.0	4642899	100.0	10980	100.0	683249	100.0	4975050	100.0

	FY2012						FY2013					
	CBT	%	Ambulatory psychotherapy				CBT	%	Ambulatory psychotherapy			
			≥ 30 min	%	< 30 min	%			≥ 30 min	%	< 30 min	%
Male (years)	3076	34.6	560242	42.1	2165896	43.2	3335	35.1	569291	42.0	2219842	43.2
0-9	38	0.4	35832	2.7	42067	0.8	87	0.9	39511	2.9	44852	0.9
10-19	205	2.3	56679	4.3	101667	2.0	289	3.0	62003	4.6	110685	2.2
20-29	596	6.7	96743	7.3	241561	4.8	634	6.7	97146	7.2	242685	4.7
30-39	820	9.2	117335	8.8	434811	8.7	791	8.3	114192	8.4	429615	8.4
40-49	669	7.5	101404	7.6	472920	9.4	707	7.4	103653	7.6	493436	9.6
50-59	361	4.1	56336	4.2	324168	6.5	358	3.8	58176	4.3	339876	6.6
60-69	132	1.5	35539	2.7	249642	5.0	165	1.7	34569	2.5	252337	4.9
70-79	123	1.4	33967	2.6	184434	3.7	159	1.7	33671	2.5	186195	3.6
≥ 80	132	1.5	26407	2.0	114626	2.3	145	1.5	26370	1.9	120161	2.3
Female (years)	5807	65.4	771408	57.9	2850916	56.8	6168	64.9	786834	58.0	2912985	56.8
0-9	13	0.1	12801	1.0	13991	0.3	32	0.3	14292	1.1	14791	0.3
10-19	327	3.7	58361	4.4	90174	1.8	334	3.5	61544	4.5	92688	1.8
20-29	1341	15.1	152412	11.4	342357	6.8	1331	14.0	153488	11.3	340023	6.6
30-39	1494	16.8	155592	11.7	497402	9.9	1445	15.2	155481	11.5	496462	9.7
40-49	1096	12.3	122844	9.2	487840	9.7	1198	12.6	129208	9.5	516329	10.1
50-59	584	6.6	73272	5.5	358659	7.1	673	7.1	76207	5.6	372409	7.3
60-69	360	4.1	64996	4.9	391051	7.8	397	4.2	65076	4.8	392264	7.6
70-79	294	3.3	69522	5.2	367981	7.3	374	3.9	69623	5.1	372923	7.3
≧80	298	3.4	61608	4.6	301461	6.0	384	4.0	61915	4.6	315096	6.1
Total	8883	100.0	1331650	100.0	5016812	100.0	9503	100.0	1356125	100.0	5132827	100.0

	FY2014						FY2015					
	CBT	%	Ambulatory psychotherapy				CBT	%	Ambulatory psychotherapy			
			≥ 30 min	%	< 30 min	%			≥ 30 min	%	< 30 min	%
Male (years)	3875	35.3	586888	42.6	2300881	43.5	3865	35.3	622021	43.1	2403172	43.7
0-9	33	0.3	43989	3.2	50390	1.0	40	0.4	47545	3.3	57976	1.1
10-19	349	3.2	64301	4.7	119572	2.3	413	3.8	71046	4.9	134036	2.4
20-29	689	6.3	99072	7.2	248292	4.7	781	7.1	106333	7.4	260323	4.7
30-39	963	8.8	113575	8.2	427762	8.1	894	8.2	115858	8.0	427604	7.8
40-49	791	7.2	107432	7.8	517169	9.8	757	6.9	112828	7.8	539896	9.8
50-59	458	4.2	61797	4.5	361529	6.8	427	3.9	67209	4.7	386159	7.0
60-69	206	1.9	35107	2.5	258163	4.9	224	2.0	36744	2.5	267293	4.9
70-79	202	1.8	33992	2.5	191525	3.6	194	1.8	35160	2.4	195045	3.6
≥ 80	184	1.7	27623	2.0	126479	2.4	135	1.2	29298	2.0	134840	2.5
Female (years)	7095	64.7	791424	57.4	2992615	56.5	7077	64.7	819723	56.9	3090963	56.3
0-9	21	0.2	15395	1.1	16580	0.3	25	0.2	16761	1.2	18807	0.3
10-19	427	3.9	61191	4.4	95814	1.8	499	4.6	67150	4.7	103448	1.9
20-29	1390	12.7	150502	10.9	338609	6.4	1398	12.8	154718	10.7	344264	6.3
30-39	1568	14.3	152600	11.1	494340	9.3	1533	14.0	152159	10.6	494355	9.0
40-49	1528	13.9	133540	9.7	545860	10.3	1636	15.0	139034	9.6	573414	10.4
50-59	779	7.1	79907	5.8	393351	7.4	830	7.6	85473	5.9	416398	7.6
60-69	432	3.9	63576	4.6	394986	7.5	373	3.4	65256	4.5	400465	7.3
70-79	467	4.3	70617	5.1	383780	7.3	399	3.6	71180	4.9	389717	7.1
≧80	483	4.4	64096	4.7	329295	6.2	384	3.5	67992	4.7	350095	6.4
Total	10970	100.0	1378312	100.0	5293496	100.0	10942	100.0	1441744	100.0	5494135	100.0

*Number of patients less than 10 people were noted as zero (-) in order to prevent unwanted identification of personal information.

Abbreviation: CBT, cognitive behavioral therapy.

Supplementary Table 2. Standardized claim ratio of outpatients who received each psychotherapies by prefecture

Prefecture	CBT	Ambulatory psychotherapy	
		≥ 30 min	< 30 min
Japan	reference*	reference*	reference*
Hokkaido	63.8	74.5	94.7
Aomori	8.7	51.7	82.1
Iwate	8.6	57.8	88.5
Miyagi	19.7	97.5	88.3
Akita	29.0	99.4	90.3
Yamagata	51.8	118.3	106.3
Fukushima	29.7	89.0	102.6
Ibaraki	138.9	60.7	71.4
Tochigi	13.9	60.7	85.0
Gunma	18.9	98.0	91.7
Saitama	42.9	68.8	77.1
Chiba	15.5	73.0	87.6
Tokyo	144.2	176.2	118.7
Kanagawa	47.8	108.2	92.2
Niigata	11.3	57.3	96.0
Toyama	60.5	66.4	85.8
Ishikawa	585.2	71.1	89.2
Fukui	1.9	81.3	97.6
Yamanashi	14.6	57.4	71.8
Nagano	5.7	95.2	97.2
Gifu	388.0	86.9	78.9
Shizuoka	75.1	70.1	83.1
Aichi	153.5	116.7	88.3
Mie	56.2	94.9	87.8
Shiga	54.6	78.6	80.2
Kyoto	193.6	118.1	82.8
Osaka	97.9	103.9	89.3
Hyogo	173.8	90.2	89.4
Nara	5.5	100.0	80.3
Wakayama	32.9	80.3	83.5
Tottori	18.4	69.1	100.3
Shimane	483.8	84.2	117.6
Okayama	352.9	117.2	97.3

Hiroshima	18.9	82.3	94.4
Yamaguchi	61.6	84.8	93.5
Tokushima	1.4	90.2	89.4
Kagawa	115.2	88.4	86.7
Ehime	78.9	74.3	96.0
Kochi	3.2	80.0	90.9
Fukuoka	115.0	97.7	81.8
Saga	1.8	76.3	80.0
Nagasaki	5.5	81.2	91.4
Kumamoto	251.2	90.9	84.9
Oita	43.4	80.7	83.5
Miyazaki	118.6	90.7	84.0
Kagoshima	103.4	79.7	75.3
Okinawa	40.4	137.3	93.4

*Standardized claim ratio of 100 indicates national mean (reference).

Abbreviation: CBT, cognitive behavioral therapy.

BMJ Open

How was cognitive behavioral therapy for mood disorder implemented in Japan?: a retrospective observational study using the nationwide claims database from FY2010 to FY2015

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Title of article:

How was cognitive behavioral therapy for mood disorder implemented in Japan?: a retrospective observational study using the nationwide claims database from FY2010 to FY2015

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ABSTRACT

Objectives: To clarify the dissemination status of cognitive behavioral therapy (CBT) in Japan under the national health insurance scheme.

Design: Retrospective observational study.

Setting: National Database of Health Insurance Claims and Specific Health Checkups of Japan.

Participants: Patients who received CBT under the national health insurance scheme from fiscal years (FY) 2010 to 2015.

Primary and secondary outcome measures: We estimated the change rate and the standardized claim ratio (SCR) for the number of patients receiving CBT and analyzed the association between the CBT status and several regional factors.

Results: We found that: (a) a total of 60,304 patients received CBT during the study period; (b) the number of patients receiving CBT was highest in the first year (-1.8% from FY2010 to FY2015); (c) the number of patients who received CBT per 100,000 population decreased (or remained at zero) in most prefectures (32 out of 47); (d) there was a maximum 424.7-fold difference between prefectures in standardized claim ratio for CBT; (e) the number of registered CBT institutions was significantly associated with the number of patients who received CBT.

Conclusions: The provision of CBT did not increase in the first six years (FY2010–2015) after its coverage in Japan's national health insurance scheme. Further studies including a questionnaire survey of registered CBT institutions are required to get more detailed information on the dissemination of CBT in Japan.

Strengths and limitations of this study:

- This is the first study to describe in the provision status of cognitive behavioral therapy (CBT) in Japan using a nationwide database which covers all electronic claims in Japan's national health insurance system.
- The main limitation of this study is that our data does not include medical treatment data for any treatment provided outside the national system (e.g. private counseling).
- Our ecological analysis was conducted using specific variables, so there could be other factors which affect the provision of CBT.

INTRODUCTION

Disseminating effective treatment for psychiatric disorders is urgently required around the world. Mathers and Loncar[1] reported that major depression is predicted to be the leading cause of burden of disease in high-income countries by 2030; HIV/AIDS and perinatal disorders rank higher only in low-income and middle-income countries. Although mood disorders including major depression have been reported to be less prevalent in Asian countries than in Western countries, they have become more common among Japanese since the 2000's, which might reflect the Japanese government's attempt to raise people's awareness of mental health.[2, 3] The rate of mental health service use in Japan has also increased in the past twenty years.[4]

Since the 1980s, effective psychological interventions for a wide range of psychiatric disorders have been empirically developed. Among them, cognitive behavioral therapy (CBT) has consistently been shown to be effective for various psychiatric disorders on both a short- and long-term basis,[5-13] and has also been a strongly recommended treatment option for both inpatients and outpatients in national guidelines.[14-18] Importantly, patients often desire to receive psychotherapy rather than pharmacotherapy.[19, 20] However, there is evidence that empirically supported

CBT is rarely available (or is delivered suboptimally) in routine clinical care in Western countries.[21, 22]

In order to address the problem, in 2008 England's National Health Service (NHS) instigated a therapists' post-qualification training program, the English Improving Access to Psychological Therapies (IAPT) program. The IAPT training program is delivered as a joint venture between universities and clinical services, and has been implemented across England. Over a one-year training period, high-intensity trainees (providing traditional face-to-face therapy) attend a university-based course for lectures, workshops and case supervision two days a week, while low-intensity trainees (providing guided self-help, brief therapy, etc.) attend university for one day per week. For the rest of their time, both sets of trainees work in an IAPT service where they receive further regular supervision. For the first ten years of the IAPT, the number of patients who received psychotherapy (including CBT) increased markedly (from 181,947 patients in fiscal year [FY] 2009 to 1,092,296 patients in FY2018).[23, 24]

In Japan, CBT was introduced to the psychiatric field in the late 1980s.[25] Since FY2010, CBT for outpatients with mood disorders has been covered by the national health insurance scheme. This marked a milestone in Japanese mental health service where pharmacotherapy has historically been much more common.[26-28]

Subsequently, since FY2011, the Japanese Ministry of Health Labor and Welfare (MHLW) has started to organize training for therapists to disseminate CBT. However, it is still unclear whether CBT is routinely implemented in Japanese clinical settings under the national health insurance scheme. Two studies have employed a questionnaire method to investigate the capability of providing CBT in Japanese psychiatric institutions, but the very low return/response rates (16.5% and 20.3%) limit the generalizability of the findings.[29, 30]

The current study aims to assess the dissemination status of CBT in the first six years (FY2010–2015) after its inclusion in the national insurance scheme in Japan, using the nationwide claims database. We selected ambulatory psychotherapy, the psychotherapy provided in the routine psychiatric outpatient care, as a reference. Data on the actual dissemination status of CBT (including regional variations) has never been widely available, and such data is needed to estimate the unmet need for services, to promote open discussion between policy makers and general public, and to guide mental health care policy initiatives in the future.

METHODS

Main data source and extracted data

The present retrospective observational study was conducted using data from the National Database of Health Insurance Claims and Specific Health Checkups of Japan (NDB), a Japanese nationwide health insurance claims database operated by the MHLW. Japan utilizes a universal healthcare system, patients pay 10−30% of their total medical fees according to patients' age and socioeconomic status. To earn all medical fees, medical care facilities have to submit medical fee claims to their municipality (see online supplementary figure 1). The NDB has all electronic claims, 99% of all claims issued from hospitals and clinics,[31] and stores approximately 1.9 billion claims annually. The claims data contains various clinical and procedural information, such as patients' sex, age, month of examination, diagnostic code, medical practice code, drug code, and hospital code. Personally identifiable data (e.g. name, beneficiary identification number, date of birth) are automatically converted into hash values at the time of storage in NDB to make it irreversibly anonymous.

We used accumulated NDB data from FY2010 to FY2015 regarding CBT [code 180035910 and 180033210]. We also collected NDB data regarding ambulatory psychotherapy as a reference (≥ 30 minutes [code 180012210] and < 30 minutes [code 180031010]). Ambulatory psychotherapy in the national health insurance scheme includes any type of psychotherapy (e.g. supportive psychotherapy) implemented by

psychiatrists in routine outpatient care. We chose this as a reference to CBT because: (1) both psychotherapies target only outpatients, and (2) both are provided only by a medical doctor (table 1). CBT and ambulatory psychotherapy cannot be ticked at the same time. Extracted NDB data provided the exact number of patients who received each psychotherapy in each age group and prefecture. Each patient was counted as "one" even though the patient received more than one session. We did not collect diagnostic codes because it is said that diagnostic codes in NDB do not reflect the actual patient's diagnosis due to insurance claims needs.[32] To address the uncertainty/inaccuracy of diagnostic codes in NDB, some studies have combined diagnostic codes with other reliable examination or treatment codes (e.g. breast cancer code + cancer treatment codes [surgery/chemotherapy/medication/radiation procedure]).[33] However, in the psychiatric field, diagnostic codes in NDB are usually based on medical doctors' own judgement, and there are no other reliable examination or treatment codes to determine specific disorders. Therefore, we only focused on reliable medical practice codes in this study.

Table 1. CBT and ambulatory psychotherapy in Japan's national health insurance scheme

	CBT	Ambulatory psychotherapy

	CBT(1) [a]	CBT(2)	≥ 30 min	< 30 min
Code	180035910	180033210	180012210	180031010
Time	> 30 min		≥ 30 min	5-30 min
Provider	trained designated psychiatrist [b, c]	trained medical doctor [b]	any psychiatrist	
Target	only mood disorder		any psychiatric disorder	
Institutional registration	+ [d]		-	
Medical fees per session	5,000 JPY (33 GBP)	4,200 JPY (28 GBP)	4,000 JPY (27 GBP)	3,300 JPY (22 GBP)
Maximum of medical fees per hour	10,000 JPY (67 GBP)	8,400 JPY (56 GBP)	8,000 JPY (54 GBP)	23,100 JPY [e] (155 GBP)

[a] CBT(1) have been established since fiscal year 2012.

[b] who received some kind of any training for CBT.

[c] Designated psychiatrist (Mental Health and Welfare Law-authorized) who also cooperates with local psychiatric emergency medical services (e.g. holiday/night medical examinations).

[d] Institutions need to register their institution's name along with CBT providers names (trained designated psychiatrists or trained medical doctors) to the Regional Bureau of Health and Welfare of Japan.

[e] assuming that a psychiatrist sees 7 patients per hour.[34]

CBT, cognitive behavioral therapy; JPY, Japanese yen; GBP, Great Britain pound.

Exchange rate: 1 GBP = 150 JPY.

Analysis

Firstly, we calculated the change rate for the number of patients who received CBT or ambulatory psychotherapy from FY2010 through FY2015. A baseline for the rate of change for each psychotherapy was the number of patients in FY2010. Secondly, we calculated the number of patients who received each psychotherapy per 100,000 population, and then assessed the increase or decrease in patients between FY2010 and FY2015 by prefecture. Thirdly, we calculated the standardized claim ratio (SCR) for the number of patients who received CBT. The indicator is based on the same logic as the standardized mortality ratio (e.g. it signifies that a prefecture with an SCR over 100 has more patients who received CBT than the national mean). The SCR is calculated according to the following formula;

$$\begin{aligned} \mathrm{SCR} &= \frac{\Sigma\ \text{Observed number (N) of claims}}{\Sigma\ \text{Expected N of claims}} \times 100 \\ &= \frac{\Sigma\ \text{Observed N of claims by age group} \times 100}{\Sigma\ \text{Population by age group} \times \text{Claim rate by age group}} \\ &= \frac{\Sigma\ \text{Observed N of claims by age group} \times 100}{\Sigma\ \text{Population by age group} \times \dfrac{\text{Observed N of claims by age group in Japan}}{\text{Population by age group in Japan}}} \end{aligned}$$

Fourthly, in order to assess regional factors related to the provision of CBT, we examined associations between CBT patients per 100,000 population and the following variables: (1) registered institutions for CBT per 100,000 population from Regional Bureau of Health and Welfare of Japan; (2) psychiatrists per 100,000 population from the portal site for Japanese Government Statistics, by using linear mixed effects models. Fixed effects were the above three variables and year; prefecture was included as a random effect. We also investigated the association between SCR for CBT and the implementation of formal CBT training (organized by the MHLW) using independent t-test. The dependent variable was SCR for CBT, and the independent variables were prefecture groups that had been classified according to whether or not formal CBT training had been implemented (at least 1 time). Significant differences were indicated at p value < 0.05. Data were analyzed using the SAS software ver. 9.4 (SAS Institute Inc., Cary, NC, USA).

Patient and public involvement

Patients or public were not involved in this study.

Results

During the study period (FY2010–2015), 60,304 patients received CBT and 34,628,225 patients received ambulatory psychotherapy. There is no big difference in terms of demographic data between these psychotherapies: more females than males received each psychotherapy, with most patients (male and female) being aged between 20–59 (see online supplementary table 1). As for trends over time (figure 1), the number of patients who received CBT dropped in FY2012 and thereafter recovered slightly from FY2013, but not to the level of FY2010 (when CBT was first added to the health insurance scheme). CBT patients decreased by 1.8% from FY2010 to FY2015. In contrast, the number of patients who received both types of ambulatory psychotherapy continued to increase; of these, ambulatory psychotherapy (≥ 30 min) increased dramatically from FY2012.

[Insert figure 1 about here]

At the prefectural level, from FY2010 to FY2015, patients receiving CBT per 100,000 population decreased (or remained at zero) in 32 of 47 prefectures, whereas patients receiving ambulatory psychotherapy per 100,000 population increased in all prefectures. Figure 2 shows the SCR for the number of patients who received each psychotherapy in the study period. There was a maximum 424.7-fold difference in SCR between the highest (SCR = 585.2 in Ishikawa) and lowest (SCR = 1.4 in Tokushima)

prefectures. Meanwhile, there was a maximum 3.4-fold difference in SCR of ambulatory psychotherapy (see online supplementary table 2).

[Insert figure 2 about here]

In terms of the relationship between regional factors and the provision of CBT, the number of patients who received CBT per 100,000 population was associated significantly with the number of registered CBT institutions per 100,000 population ($p < 0.01$) (table 2). If the number of registered institutions per 100,000 population increased by one, the number of patients increased by 23.1 (standard error = 3.4) patients per 100,000 population. The other factors were not associated with the number of CBT patients per 100,000 population or SCR for CBT (table 2 and 3).

Table 2. Results of ecological analysis on factors associated with number of patients who received CBT per 100,000 population (FY2010–2015)

		Estimate	Standard error	Degree of freedom	T value	p value
Number of registered CBT institutions per 100,000 population	Intercept	-5.0	2.6	46	-1.9	0.06
	Slope	23.1	3.4	137	6.7	< 0.01*
Number of psychiatrists	Intercept	4.4	5.9	46	0.7	0.46

per 100,000 population	Slope	0.3	0.4	91	0.6	0.52

* indicates significant difference.

CBT, cognitive behavioral therapy; FY, fiscal year.

Table 3. Association between implementation of formal CBT training and SCR for CBT (FY2010–2015)

	Training [-]	Training [+]	p value
Prefectures (n)	37	10	-
SCR for CBT (Mean ± SE)	98.0 ± 23.0	73.2 ± 19.9	0.59

Degree of freedom = 45, t value = 0.54.

CBT, cognitive behavioral therapy; SCR, standardized claim ratio; FY, fiscal year; SE, standard error.

DISCUSSION

This is the first study to use the nationwide claim database to demonstrate in detail the provision status of CBT in Japan in the first six years (FY2010–2015) after its inclusion in the national health insurance scheme. Our results show that: (a) approximately 60,000 patients received CBT during the study period; (b) the number of patients receiving CBT was highest in the first year (-1.8% from FY2010 to FY2015), whereas

ambulatory psychotherapies continued to increase over six years (+121.3% [≥ 30 min] and +17.7% [< 30 min] from FY2010 to FY2015); (c) the number of patients receiving CBT per 100,000 decreased (or remained at zero) in most prefectures (32 out of 47); (d) based on SCR, there was a maximum 420-fold regional difference in the number of CBT patients between prefectures; (e) the number of registered CBT institutions was significantly associated with the number of patients receiving CBT. Overall, the current study indicates that the provision of CBT did not increase under Japan's health insurance scheme from FY2010 to FY2015.

The reasons that the provision of CBT reached a plateau in Japan could be due to strict requirements and low medical fees for therapists/institutions in the national health insurance system. For example, a CBT provider must be a medical doctor, must target only outpatients with mood disorder, and the provider's institution must be registered to the Regional Bureau of Health and Welfare of Japan (table 1). Because CBT is only allowed to treat mood disorders, one would reasonably expect ambulatory psychotherapy to be provided at a higher rate than CBT. In terms of medical fees, CBT fees in Japan are substantially lower than those in Western countries. For example, in Japan, maximum fee for CBT is 5,000 Japanese yen (JPY) per session (equal to 33 Great Britain pounds [GBP], exchange rate: 1 GBP = 150 JPY), whereas the fee in

England is 97 GBP (equal to 14,550 JPY) per session.[35] Moreover, CBT fees are almost the same as ambulatory psychotherapy fees for sessions over 30 minutes despite the aforementioned restrictions (table 1). Thus, ambulatory psychotherapy sessions under 30 minutes yield the highest profits for medical doctors in Japan's national health insurance system. Indeed, Japanese psychiatrists see 7 outpatients per hour in routine clinical practice.[34] Furthermore, some studies have reported that the main obstacles in providing psychotherapy/CBT in Japan are a lack of time and profitability.[29, 30] Thus, more reasonable medical fees and requirements suitable to the actual conditions of routine clinical practice could motivate the use of CBT under the national health insurance scheme in Japan. Although we focused mainly on outpatient settings here, CBT for inpatients should also be included in the national health insurance scheme because it is recommended for inpatients with some disorders as well as in many international guidelines.

This study focused on CBT but a large shift in ambulatory psychotherapy (≥ 30 min) in FY2012 should be addressed. It seems that this large shift was caused by the revision of medical fee requirements for ambulatory psychotherapy in that year. Before the revision in FY2012, psychiatrists at any psychiatric institution were able to claim one type of ambulatory psychotherapy when they spent more than 60 minutes with a

patient for the first visit. However, the revision imposed cooperation with local psychiatric emergency medical services (e.g. holiday/night medical examinations) on psychiatrists for this type of ambulatory psychotherapy. Because of this, many psychiatrists (especially those working at small psychiatric institutions) were no longer able to claim the optional fees for ambulatory psychotherapy applied on the first visit. As a result, it is possible that psychiatrists started claiming outpatients in the first visit as covered by "ambulatory psychotherapy (≥ 30 min)".

Our results also showed a maximum approximately 420-fold difference in SCR for CBT between prefectures, and a maximum 3.4-fold difference in SCR for ambulatory psychotherapy. Namely, there was a large regional variation in CBT utilization. In particular, SCR was low over the whole Tohoku region where effective treatment for psychiatric disorders is in high demand because of the high suicide rate.[36] In contrast, SCR in some prefectures (e.g. Ishikawa, Shimane, Gifu, Okayama, Kumamoto) was noticeably high. Investigation into CBT efforts in these areas would be helpful to fill in the gaps in regional variations in providing CBT. On the other hand, one of the reasons for the large variation in SCR between prefectures may be that the total number of CBT patients in Japan is small. Therefore, if a single institution in a

particular prefecture has many CBT patients, the SCR in that area would be overestimated because it is an indicator calculated from the national mean.

During the study period, formal CBT training had been implemented in 10 out of 47 prefectures. We predicted that the implementation of formal CBT training would be associated with SCR for CBT, but there was no association between these variables. The training consists of a two-day onsite workshop and continuous online clinical supervision. Thus, one of the reasons that medical doctors in regions with no workshop training can continue to provide CBT may be because they can receive continuous online supervised instruction irrespective of area. There was also a significant association between the number of CBT patients per 100,000 population and the number of registered CBT institutions per 100,000 population. These results suggest that an increase in institutions that have formally-trained medical doctors and that meet institutional criteria for CBT could lead to a wide-scale dissemination of CBT under the national health insurance scheme.

In order to make CBT much more widely available, recent success in England also offer lessons that are likely applicable to Japan. In England, the number of patients with depression finishing CBT increased by 181.2% from FY2013 to FY2018 (28,814 patients to 81,038 patients).[37] One of the reasons for this success could be an increase

in the number of therapists through a goverment-funded one-year systematic training, IAPT (over new 7,000 therapists have trained in FY2015[38]). Because both England and Japan have a universal healthcare system, such financial and logistical supports from health care policymakers are crucial for a wide-scale implementation of CBT in Japan.

The strength of this study is that the data source was the NDB, a comprehensive database which covers all electronic claims in Japan's national health insurance system. However, there are also several limitations. First, the NDB does not store medical treatment data for any treatment provided outside the national system (e.g. private counseling). Although CBT for depression in Japan is mainly provided by psychologists in routine care,[39] it is not covered by the national health insurance system. Thus, there is a possibility that more CBT was actually conducted across Japan, even in prefectures with few CBT patients under the health insurance scheme. Second, we selected ambulatory psychotherapy as a reference to CBT because both psychotherapies target only outpatients and both are provided only by a medical doctor. However, this is still not an ideal reference because the provider and target of both psychotherapies are not perfect analogs. Third, our ecological analysis was conducted using specific variables. There could be other factors which affect the provision of CBT.

Finally, the observation period in this study is slightly outdated due to a delayed acquisition process for NDB data from the MHLW. However, we believe that the current study still has academic value for the following reasons. First, this is the first study to demonstrate the status of CBT in Japan using comprehensive public data. Second, our findings would be useful to future researchers/policymakers reviewing the status of CBT in Japan after the observation period of this study. Because of these limitations, further updates on the NDB (FY2016–) and the questionnaire survey of registered CBT institutions are required.

Overall, our current study revealed some issues regarding the provision of CBT in Japan in the first six years (FY2010–2015) after its coverage in the national health insurance scheme. The number of patients receiving CBT in Japan did not increase probably due to unprofitability for therapists/institutions in Japan's current healthcare insurance system. Further, there were large regional variations in CBT status between the 47 prefectures and a significant association between the number of CBT patients per 100,000 population and the number of registered CBT institutions per 100,000 population. These findings suggest that an appropriate evaluation of medical fees for CBT in clinical settings and supporting hospitals and/or clinics in meeting the institutional criteria for CBT would help in the widespread utilization of CBT in Japan.

Further research into the status of CBT in Japan after the observation period of this study (FY2016–) and a questionnaire survey of registered CBT institutions are required to get more detailed information on the dissemination of CBT.

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Competing interests: NY has received a speaking honorarium from Gakken Medical Support, and writing honoraria from Igaku Shoin, Nihon-Hyouronsha, Sogensha, and Medical Friend. The other authors declare that they have no conflicts of interest.

Patients consent for publication: Not required.

Ethics approval: The study protocol was reviewed and approved by the Ethics Committee of the University of Miyazaki (reference number: O-0017). We also got permission to use a dataset extracted from the NDB (reference number: 1025-1). Written informed consent was waived because all patient records were automatically anonymized prior to storage in NDB (i.e. no one can identify specific patients).

Provenance and peer review: Not commissioned; externally peer reviewed.

Data sharing statement: The data used in this study are from the Ministry of Health, Labour and Welfare (MHLW) in Japan and therefore, users of these data are strictly limited to those who obtain official permission from the MHLW, in accordance with Japanese Article 33 (Provision of Questionnaire Information) of the Statistics Act, by

the Statistic Bureau, Ministry of Internal Affairs and Communications. Qualified researchers who would like to request access to the data should contact the Statistics and Information Department of the MHLW. Please refer to the following URL: http://www.mhlw.go.jp/toukei/sonota/chousahyo.html.

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Figure legends:

Figure 1. Trends over time for the number of outpatients who received psychotherapy in Japan.

FY, fiscal year.

Figure 2. Geographical distribution of standardized claim ratio (SCR) for the number of outpatients who received psychotherapy in Japan from fiscal years 2010 to 2015.

The color bar shows a degree of SCR. SCR of 100 indicates the national mean.

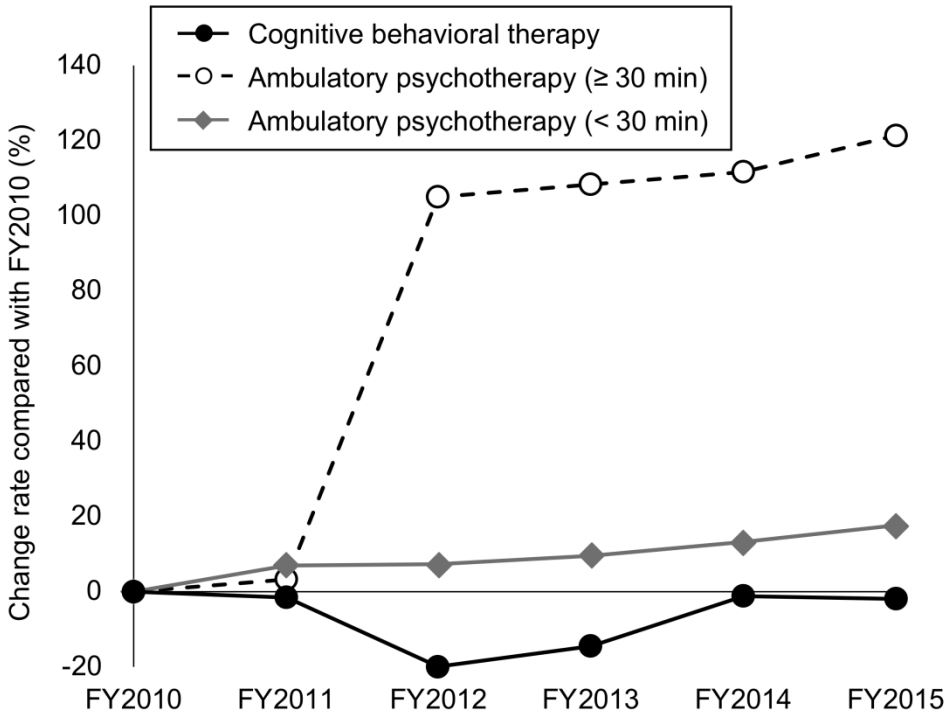

Figure 1. Trends over time for the number of outpatients who received psychotherapy in Japan. FY, fiscal year.

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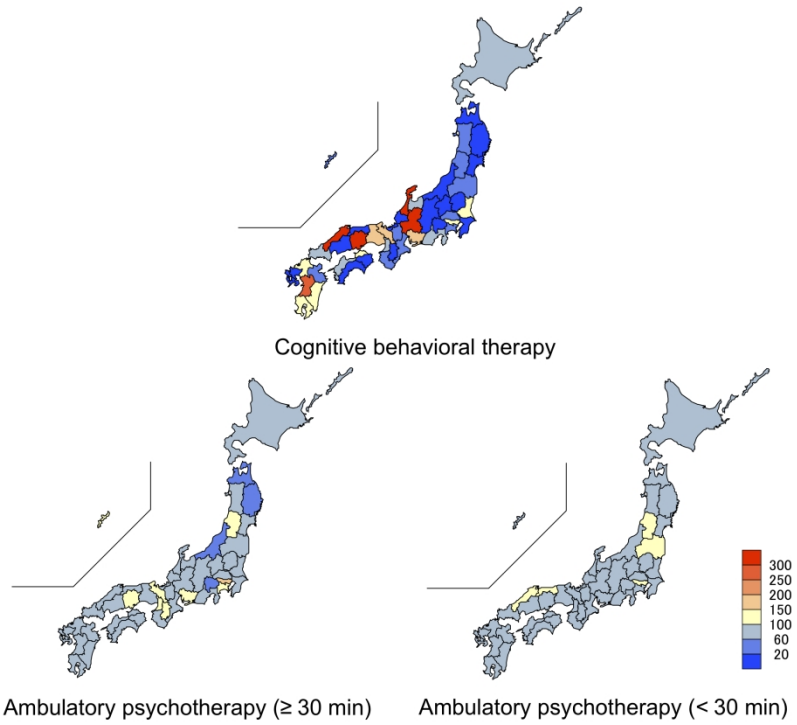
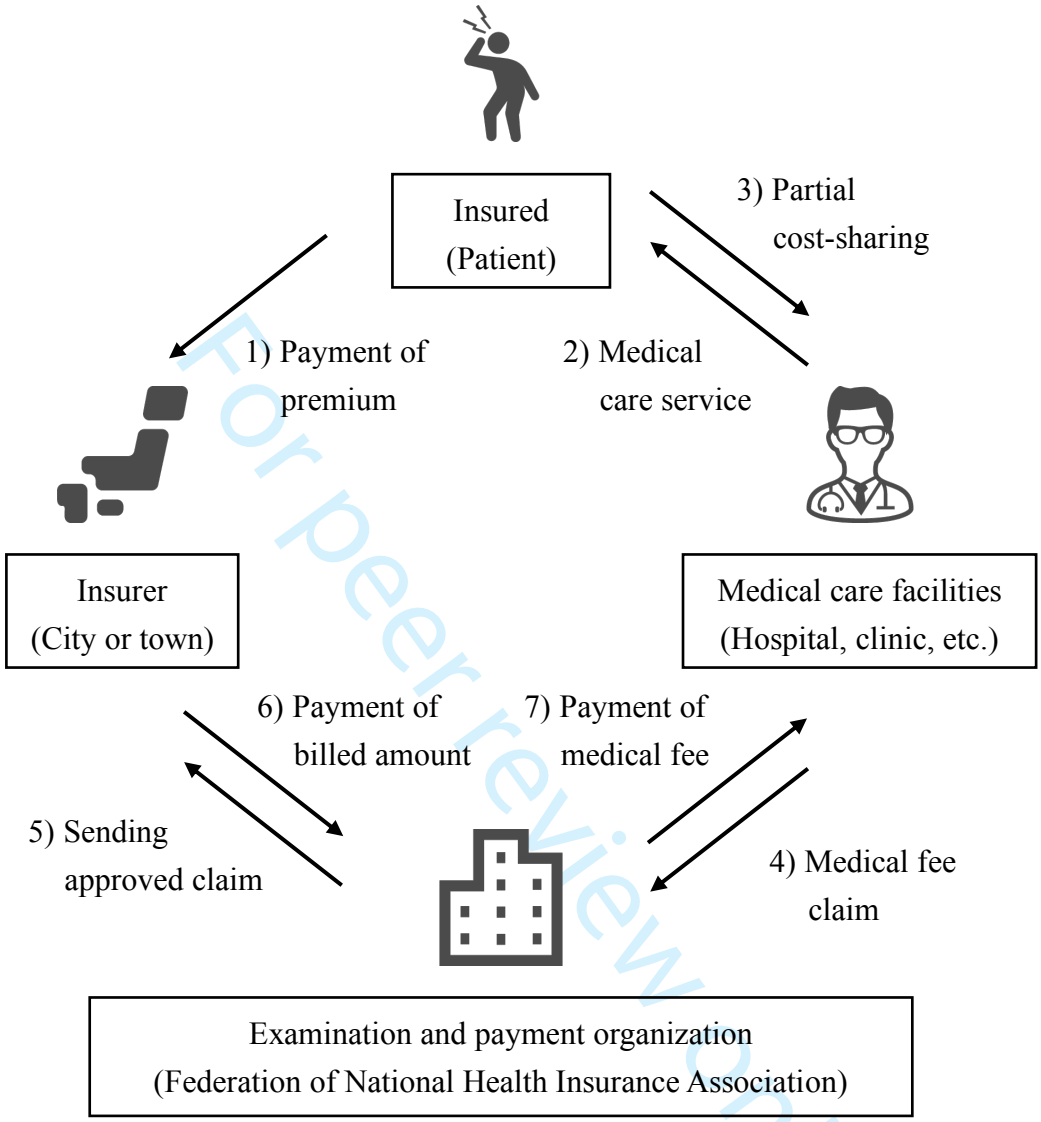


Figure 2. Geographical distribution of standardized claim ratio (SCR) for the number of outpatients who received psychotherapy in Japan from fiscal years 2010 to 2015. The color bar shows a degree of SCR. SCR of 100 indicates the national mean.

254x190mm (300 x 300 DPI)

Supplementary Figure 1. Overview of Japan's universal healthcare system



Supplementary Table 1. Demographic data of outpatients who received each psychotherapies by sex and age groups

	FY2010						FY2011					
	CBT	%	Ambulatory psychotherapy				CBT	%	Ambulatory psychotherapy			
			≥ 30 min	%	< 30 min	%			≥ 30 min	%	< 30 min	%
Male (years)	3,911	34.9	266,900	40.4	1,979,923	42.6	3,896	35.5	279,000	40.8	2,135,354	42.9
0-9	13	0.1	24,510	3.7	34,028	0.7	87	0.8	26,480	3.9	37,825	0.8
10-19	135	1.2	33,955	5.1	85,966	1.9	230	2.1	35,715	5.2	95,109	1.9
20-29	660	5.9	39,449	6.0	231,457	5.0	648	5.9	41,733	6.1	242,586	4.9
30-39	1,027	9.2	52,128	7.9	429,146	9.2	931	8.5	52,961	7.8	447,328	9.0
40-49	900	8.0	43,379	6.6	418,062	9.0	821	7.5	45,867	6.7	457,105	9.2
50-59	451	4.0	25,776	3.9	298,054	6.4	426	3.9	26,776	3.9	321,345	6.5
60-69	304	2.7	18,412	2.8	225,926	4.9	270	2.5	18,563	2.7	252,745	5.1
70-79	233	2.1	17,154	2.6	165,747	3.6	254	2.3	17,855	2.6	180,096	3.6
≥ 80	188	1.7	12,137	1.8	91,537	2.0	229	2.1	13,050	1.9	101,215	2.0
Female (years)	7,285	65.1	393,585	59.6	2,662,976	57.4	7,084	64.5	404,249	59.2	2,839,696	57.1
0-9	-*	-*	8,532	1.3	11,131	0.2	27	0.2	9,415	1.4	12,570	0.3
10-19	240	2.1	35,604	5.4	90,061	1.9	314	2.9	35,701	5.2	92,282	1.9
20-29	1,435	12.8	73,045	11.1	349,509	7.5	1,475	13.4	73,823	10.8	356,484	7.2
30-39	1,821	16.3	82,301	12.5	496,888	10.7	1,684	15.3	82,397	12.1	515,329	10.4
40-49	1,317	11.8	59,671	9.0	432,489	9.3	1,187	10.8	63,124	9.2	471,593	9.5
50-59	745	6.7	37,629	5.7	341,547	7.4	640	5.8	38,391	5.6	360,082	7.2
60-69	596	5.3	33,855	5.1	362,120	7.8	570	5.2	34,571	5.1	400,893	8.1
70-79	607	5.4	34,972	5.3	337,177	7.3	573	5.2	36,171	5.3	363,038	7.3
≧80	524	4.7	27,976	4.2	242,054	5.2	614	5.6	30,656	4.5	267,425	5.4
Total	11,196	100.0	660,485	100.0	4,642,899	100.0	10,980	100.0	683,249	100.0	4,975,050	100.0

	FY2012						FY2013					
	CBT	%	Ambulatory psychotherapy				CBT	%	Ambulatory psychotherapy			
			≥ 30 min	%	< 30 min	%			≥ 30 min	%	< 30 min	%
Male (years)	3,076	34.6	560,242	42.1	2,165,896	43.2	3,335	35.1	569,291	42.0	2,219,842	43.2
0-9	38	0.4	35,832	2.7	42,067	0.8	87	0.9	39,511	2.9	44,852	0.9
10-19	205	2.3	56,679	4.3	101,667	2.0	289	3.0	62,003	4.6	110,685	2.2
20-29	596	6.7	96,743	7.3	241,561	4.8	634	6.7	97,146	7.2	242,685	4.7
30-39	820	9.2	117,335	8.8	434,811	8.7	791	8.3	114,192	8.4	429,615	8.4
40-49	669	7.5	101,404	7.6	472,920	9.4	707	7.4	103,653	7.6	493,436	9.6
50-59	361	4.1	56,336	4.2	324,168	6.5	358	3.8	58,176	4.3	339,876	6.6
60-69	132	1.5	35,539	2.7	249,642	5.0	165	1.7	34,569	2.5	252,337	4.9
70-79	123	1.4	33,967	2.6	184,434	3.7	159	1.7	33,671	2.5	186,195	3.6
≥ 80	132	1.5	26,407	2.0	114,626	2.3	145	1.5	26,370	1.9	120,161	2.3
Female (years)	5,807	65.4	771,408	57.9	2,850,916	56.8	6,168	64.9	786,834	58.0	2,912,985	56.8
0-9	13	0.1	12,801	1.0	13,991	0.3	32	0.3	14,292	1.1	14,791	0.3
10-19	327	3.7	58,361	4.4	90,174	1.8	334	3.5	61,544	4.5	92,688	1.8
20-29	1,341	15.1	152,412	11.4	342,357	6.8	1,331	14.0	153,488	11.3	340,023	6.6
30-39	1,494	16.8	155,592	11.7	497,402	9.9	1,445	15.2	155,481	11.5	496,462	9.7
40-49	1,096	12.3	122,844	9.2	487,840	9.7	1,198	12.6	129,208	9.5	516,329	10.1
50-59	584	6.6	73,272	5.5	358,659	7.1	673	7.1	76,207	5.6	372,409	7.3
60-69	360	4.1	64,996	4.9	391,051	7.8	397	4.2	65,076	4.8	392,264	7.6
70-79	294	3.3	69,522	5.2	367,981	7.3	374	3.9	69,623	5.1	372,923	7.3
≧80	298	3.4	61,608	4.6	301,461	6.0	384	4.0	61,915	4.6	315,096	6.1
Total	8,883	100.0	1,331,650	100.0	5,016,812	100.0	9,503	100.0	1356,125	100.0	5,132,827	100.0

	FY2014						FY2015					
	CBT	%	Ambulatory psychotherapy				CBT	%	Ambulatory psychotherapy			
			≥ 30 min	%	< 30 min	%			≥ 30 min	%	< 30 min	%
Male (years)	3,875	35.3	586,888	42.6	2,300,881	43.5	3,865	35.3	622,021	43.1	2,403,172	43.7
0-9	33	0.3	43,989	3.2	50,390	1.0	40	0.4	47,545	3.3	57,976	1.1
10-19	349	3.2	64,301	4.7	119,572	2.3	413	3.8	71,046	4.9	134,036	2.4
20-29	689	6.3	99,072	7.2	248,292	4.7	781	7.1	106,333	7.4	260,323	4.7
30-39	963	8.8	113,575	8.2	427,762	8.1	894	8.2	115,858	8.0	427,604	7.8
40-49	791	7.2	107,432	7.8	517,169	9.8	757	6.9	112,828	7.8	539,896	9.8
50-59	458	4.2	61,797	4.5	361,529	6.8	427	3.9	67,209	4.7	386,159	7.0
60-69	206	1.9	35,107	2.5	258,163	4.9	224	2.0	36,744	2.5	267,293	4.9
70-79	202	1.8	33,992	2.5	191,525	3.6	194	1.8	35,160	2.4	195,045	3.6
≥ 80	184	1.7	27,623	2.0	126,479	2.4	135	1.2	29,298	2.0	134,840	2.5
Female (years)	7,095	64.7	791,424	57.4	2,992,615	56.5	7,077	64.7	819,723	56.9	3,090,963	56.3
0-9	21	0.2	15,395	1.1	16,580	0.3	25	0.2	16,761	1.2	18,807	0.3
10-19	427	3.9	61,191	4.4	95,814	1.8	499	4.6	67,150	4.7	103,448	1.9
20-29	1,390	12.7	150,502	10.9	338,609	6.4	1,398	12.8	154,718	10.7	344,264	6.3
30-39	1,568	14.3	152,600	11.1	494,340	9.3	1,533	14.0	152,159	10.6	494,355	9.0
40-49	1,528	13.9	133,540	9.7	545,860	10.3	1,636	15.0	139,034	9.6	573,414	10.4
50-59	779	7.1	79,907	5.8	393,351	7.4	830	7.6	85,473	5.9	416,398	7.6
60-69	432	3.9	63,576	4.6	394,986	7.5	373	3.4	65,256	4.5	400,465	7.3
70-79	467	4.3	70,617	5.1	383,780	7.3	399	3.6	71,180	4.9	389,717	7.1
≧80	483	4.4	64,096	4.7	329,295	6.2	384	3.5	67,992	4.7	350,095	6.4
Total	10,970	100.0	1,378,312	100.0	5,293,496	100.0	10,942	100.0	1,441,744	100.0	5,494,135	100.0

*Number of patients less than 10 people were noted as zero (-) in order to prevent unwanted identification of personal information.

Abbreviation: CBT, cognitive behavioral therapy; FY, fiscal year.

Supplementary Table 2. Standardized claim ratio of outpatients who received each psychotherapies by prefecture

Prefecture	CBT	Ambulatory psychotherapy	
		≥ 30 min	< 30 min
Japan	reference*	reference*	reference*
Hokkaido	63.8	74.5	94.7
Aomori	8.7	51.7	82.1
Iwate	8.6	57.8	88.5
Miyagi	19.7	97.5	88.3
Akita	29.0	99.4	90.3
Yamagata	51.8	118.3	106.3
Fukushima	29.7	89.0	102.6
Ibaraki	138.9	60.7	71.4
Tochigi	13.9	60.7	85.0
Gunma	18.9	98.0	91.7
Saitama	42.9	68.8	77.1
Chiba	15.5	73.0	87.6
Tokyo	144.2	176.2	118.7
Kanagawa	47.8	108.2	92.2
Niigata	11.3	57.3	96.0
Toyama	60.5	66.4	85.8
Ishikawa	585.2	71.1	89.2
Fukui	1.9	81.3	97.6
Yamanashi	14.6	57.4	71.8
Nagano	5.7	95.2	97.2
Gifu	388.0	86.9	78.9
Shizuoka	75.1	70.1	83.1
Aichi	153.5	116.7	88.3
Mie	56.2	94.9	87.8
Shiga	54.6	78.6	80.2
Kyoto	193.6	118.1	82.8
Osaka	97.9	103.9	89.3
Hyogo	173.8	90.2	89.4
Nara	5.5	100.0	80.3
Wakayama	32.9	80.3	83.5
Tottori	18.4	69.1	100.3
Shimane	483.8	84.2	117.6
Okayama	352.9	117.2	97.3

Hiroshima	18.9	82.3	94.4
Yamaguchi	61.6	84.8	93.5
Tokushima	1.4	90.2	89.4
Kagawa	115.2	88.4	86.7
Ehime	78.9	74.3	96.0
Kochi	3.2	80.0	90.9
Fukuoka	115.0	97.7	81.8
Saga	1.8	76.3	80.0
Nagasaki	5.5	81.2	91.4
Kumamoto	251.2	90.9	84.9
Oita	43.4	80.7	83.5
Miyazaki	118.6	90.7	84.0
Kagoshima	103.4	79.7	75.3
Okinawa	40.4	137.3	93.4

*Standardized claim ratio of 100 indicates national mean (reference).

Abbreviation: CBT, cognitive behavioral therapy.

STROBE 2007 (v4) checklist of items to be included in reports of observational studies in epidemiology*

Checklist for cohort, case-control, and cross-sectional studies (combined)

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	Title page
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	P1–2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	P3–5
Objectives	3	State specific objectives, including any pre-specified hypotheses	P5
Methods			
Study design	4	Present key elements of study design early in the paper	P6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	P6–7
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	N/A
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	N/A
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	P6–10
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	P6–10
Bias	9	Describe any efforts to address potential sources of bias	N/A
Study size	10	Explain how the study size was arrived at	N/A
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	P9–10
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	P9–10
		(*b*) Describe any methods used to examine subgroups and interactions	N/A
		(*c*) Explain how missing data were addressed	N/A
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed	N/A

		Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy	
		(*e*) Describe any sensitivity analyses	N/A
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	P11
		(b) Give reasons for non-participation at each stage	N/A
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	P11
		(b) Indicate number of participants with missing data for each variable of interest	N/A
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	N/A
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	N/A
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	N/A
		Cross-sectional study—Report numbers of outcome events or summary measures	N/A
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	P11–13
		(*b*) Report category boundaries when continuous variables were categorized	N/A
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	N/A
Discussion			
Key results	18	Summarise key results with reference to study objectives	P13–14
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	P18–19
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	P13–20
Generalisability	21	Discuss the generalisability (external validity) of the study results	P18
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	P20

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.
Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

How was cognitive behavioral therapy for mood disorder implemented in Japan?: a retrospective observational study using the nationwide claims database from FY2010 to FY2015

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How was cognitive behavioral therapy for mood disorder implemented in Japan?: a retrospective observational study using the nationwide claims database from FY2010 to FY2015

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ABSTRACT

Objectives: To clarify the dissemination status of cognitive behavioral therapy (CBT) in Japan under the national health insurance scheme.

Design: Retrospective observational study.

Setting: National Database of Health Insurance Claims and Specific Health Checkups of Japan.

Participants: Patients who received CBT under the national health insurance scheme from fiscal years (FY) 2010 to 2015.

Primary and secondary outcome measures: We estimated the change rate and the standardized claim ratio (SCR) for the number of patients receiving CBT and analyzed the association between the CBT status and several regional factors.

Results: We found that: (a) a total of 60,304 patients received CBT during the study period; (b) the number of patients receiving CBT was highest in the first year (-1.8% from FY2010 to FY2015); (c) the number of patients who received CBT per 100,000 population decreased (or remained at zero) in most prefectures (32 out of 47); (d) there was a maximum 424.7-fold difference between prefectures in standardized claim ratio for CBT; (e) the number of registered CBT institutions was significantly associated with the number of patients who received CBT.

Conclusions: The provision of CBT did not increase in the first six years (FY2010–2015) after its coverage in Japan's national health insurance scheme. Further studies including a questionnaire survey of registered CBT institutions are required to get more detailed information on the dissemination of CBT in Japan.

Strengths and limitations of this study:

- This is the first study to describe the provision status of cognitive behavioral therapy (CBT) in Japan using a nationwide database which covers all electronic claims in Japan's national health insurance system.
- The main limitation of this study is that our data does not include medical treatment data for any treatment provided outside the national system (e.g. private counseling).
- The ecological analysis was conducted using specific variables, so there could be other factors which affect the provision of CBT.

INTRODUCTION

Disseminating effective treatment for psychiatric disorders is urgently required around the world. Mathers and Loncar[1] reported that major depression is predicted to be the leading cause of burden of disease in high-income countries by 2030; HIV/AIDS and perinatal disorders rank higher only in low-income and middle-income countries. Although mood disorders including major depression have been reported to be less prevalent in Asian countries than in Western countries, they have become more common among Japanese since the 2000's, which might reflect the Japanese government's attempt to raise people's awareness of mental health.[2, 3] The rate of mental health service use in Japan has also increased in the past twenty years.[4]

Since the 1980s, effective psychological interventions for a wide range of psychiatric disorders have been empirically developed. Among them, cognitive behavioral therapy (CBT) has consistently been shown to be effective for various psychiatric disorders on both a short- and long-term basis,[5-13] and has also been a strongly recommended treatment option for both inpatients and outpatients in national guidelines.[14-18] Importantly, patients often desire to receive psychotherapy rather than pharmacotherapy.[19, 20] However, there is evidence that empirically supported

CBT is rarely available (or is delivered suboptimally) in routine clinical care in Western countries.[21, 22]

In order to address the problem, in 2008 England's National Health Service (NHS) instigated a therapists' post-qualification training program, the English Improving Access to Psychological Therapies (IAPT) program. The IAPT training program is delivered as a joint venture between universities and clinical services, and has been implemented across England. Over a one-year training period, high-intensity trainees (providing traditional face-to-face therapy) attend a university-based course for lectures, workshops and case supervision two days a week, while low-intensity trainees (providing guided self-help, brief therapy, etc.) attend university for one day per week. For the rest of their time, both sets of trainees work in an IAPT service where they receive further regular supervision. For the first ten years of the IAPT, the number of patients who received psychotherapy (including CBT) increased markedly (from 181,947 patients in fiscal year [FY] 2009 to 1,092,296 patients in FY2018).[23, 24]

In Japan, CBT was introduced to the psychiatric field in the late 1980s.[25] Since FY2010, CBT for outpatients with mood disorders has been covered by the national health insurance scheme. This marked a milestone in Japanese mental health service where pharmacotherapy has historically been much more common.[26-28]

Subsequently, since FY2011, the Japanese Ministry of Health Labor and Welfare (MHLW) has started to organize training for therapists to disseminate CBT. However, it is still unclear whether CBT is routinely implemented in Japanese clinical settings under the national health insurance scheme. Two studies have employed a questionnaire method to investigate the capability of providing CBT in Japanese psychiatric institutions, but the very low return/response rates (16.5% and 20.3%) limit the generalizability of the findings.[29, 30]

The current study aims to assess the dissemination status of CBT in the first six years (FY2010–2015) after its inclusion in the national insurance scheme in Japan, using the nationwide claims database. We selected ambulatory psychotherapy, the psychotherapy provided in the routine psychiatric outpatient care, as a reference. Data on the actual dissemination status of CBT (including regional variations) has never been widely available, and such data is needed to estimate the unmet need for services, to promote open discussion between policy makers and general public, and to guide mental health care policy initiatives in the future.

METHODS

Main data source and extracted data

The present retrospective observational study was conducted using data from the National Database of Health Insurance Claims and Specific Health Checkups of Japan (NDB), a Japanese nationwide health insurance claims database operated by the MHLW. Japan utilizes a universal healthcare system, patients pay 10–30% of their total medical fees according to patients' age and socioeconomic status. To earn all medical fees, medical care facilities have to submit medical fee claims to their municipality (see online supplementary figure 1). The NDB has all electronic claims, 99% of all claims issued from hospitals and clinics,[31] and stores approximately 1.9 billion claims annually. The claims data contains various clinical and procedural information, such as patients' sex, age, month of examination, diagnostic code, medical practice code, drug code, and hospital code. Personally identifiable data (e.g. name, beneficiary identification number, date of birth) are automatically converted into hash values at the time of storage in NDB to make it irreversibly anonymous.

We used accumulated NDB data from FY2010 to FY2015 regarding CBT [code 180035910 and 180033210]. We also collected NDB data regarding ambulatory psychotherapy as a reference (≥ 30 minutes [code 180012210] and < 30 minutes [code 180031010]). Ambulatory psychotherapy in the national health insurance scheme includes any type of psychotherapy (e.g. supportive psychotherapy) implemented by

psychiatrists in routine outpatient care. We chose this as a reference to CBT because: (1) both psychotherapies target only outpatients, and (2) both are provided only by a medical doctor (table 1). CBT and ambulatory psychotherapy cannot be ticked at the same time. Extracted NDB data provided the exact number of patients who received each psychotherapy in each age group and prefecture. Each patient was counted as "one" even though the patient received more than one session. We did not collect diagnostic codes because it is said that diagnostic codes in NDB do not reflect the actual patient's diagnosis due to insurance claims needs.[32] To address the uncertainty/inaccuracy of diagnostic codes in NDB, some studies have combined diagnostic codes with other reliable examination or treatment codes (e.g. breast cancer code + cancer treatment codes [surgery/chemotherapy/medication/radiation procedure]).[33] However, in the psychiatric field, diagnostic codes in NDB are usually based on medical doctors' own judgement, and there are no other reliable examination or treatment codes to determine specific disorders. Therefore, we only focused on reliable medical practice codes in this study.

Table 1. CBT and ambulatory psychotherapy in Japan's national health insurance scheme

	CBT	Ambulatory psychotherapy

	CBT(1) [a]	CBT(2)	≥ 30 min	< 30 min
Code	180035910	180033210	180012210	180031010
Time	> 30 min		≥ 30 min	5-30 min
Provider	trained designated psychiatrist [b, c]	trained medical doctor [b]	any psychiatrist	
Target	only mood disorder		any psychiatric disorder	
Institutional registration	+ [d]		-	
Medical fees per session	5,000 JPY (33 GBP)	4,200 JPY (28 GBP)	4,000 JPY (27 GBP)	3,300 JPY (22 GBP)
Maximum of medical fees per hour	10,000 JPY (67 GBP)	8,400 JPY (56 GBP)	8,000 JPY (54 GBP)	23,100 JPY [e] (155 GBP)

[a] CBT(1) have been established since fiscal year 2012.

[b] who received some kind of any training for CBT.

[c] Designated psychiatrist (Mental Health and Welfare Law-authorized) who also cooperates with local psychiatric emergency medical services (e.g. holiday/night medical examinations).

[d] Institutions need to register their institution's name along with CBT providers names (trained designated psychiatrists or trained medical doctors) to the Regional Bureau of Health and Welfare of Japan.

[e] assuming that a psychiatrist sees 7 patients per hour.[34]

CBT, cognitive behavioral therapy; JPY, Japanese yen; GBP, Great Britain pound.

Exchange rate: 1 GBP = 150 JPY.

Analysis

Firstly, we calculated the change rate for the number of patients who received CBT or ambulatory psychotherapy from FY2010 through FY2015. A baseline for the rate of change for each psychotherapy was the number of patients in FY2010. Secondly, we calculated the number of patients who received each psychotherapy per 100,000 population, and then assessed the increase or decrease in patients between FY2010 and FY2015 by prefecture. Thirdly, we calculated the standardized claim ratio (SCR) for the number of patients who received CBT. The indicator is based on the same logic as the standardized mortality ratio (e.g. it signifies that a prefecture with an SCR over 100 has more patients who received CBT than the national mean). The SCR is calculated according to the following formula;

$$\begin{aligned} \mathrm{SCR} &= \frac{\Sigma\ \text{Observed number (N) of claims}}{\Sigma\ \text{Expected N of claims}} \times 100 \\ &= \frac{\Sigma\ \text{Observed N of claims by age group} \times 100}{\Sigma\ \text{Population by age group} \times \text{Claim rate by age group}} \\ &= \frac{\Sigma\ \text{Observed N of claims by age group} \times 100}{\Sigma\ \text{Population by age group} \times \dfrac{\text{Observed N of claims by age group in Japan}}{\text{Population by age group in Japan}}} \end{aligned}$$

Fourthly, in order to assess regional factors related to the provision of CBT, we examined associations between CBT patients per 100,000 population and the following variables: (1) registered institutions for CBT per 100,000 population from Regional Bureau of Health and Welfare of Japan; (2) psychiatrists per 100,000 population from the portal site for Japanese Government Statistics, by using linear mixed effects models. Fixed effects were the above three variables and year; prefecture was included as a random effect. We also investigated the association between SCR for CBT and the implementation of formal CBT training (organized by the MHLW) using independent t-test. The dependent variable was SCR for CBT, and the independent variables were prefecture groups that had been classified according to whether or not formal CBT training had been implemented (at least 1 time). Significant differences were indicated at p value < 0.05. Data were analyzed using the SAS software ver. 9.4 (SAS Institute Inc., Cary, NC, USA).

Patient and public involvement

Patients or public were not involved in this study.

Results

During the study period (FY2010–2015), 60,304 patients received CBT and 34,628,225 patients received ambulatory psychotherapy. There is no big difference in terms of demographic data between these psychotherapies: more females than males received each psychotherapy, with most patients (male and female) being aged between 20–59 (see online supplementary table 1). As for trends over time (figure 1), the number of patients who received CBT dropped in FY2012 and thereafter recovered slightly from FY2013, but not to the level of FY2010 (when CBT was first added to the health insurance scheme). CBT patients decreased by 1.8% from FY2010 to FY2015. In contrast, the number of patients who received both types of ambulatory psychotherapy continued to increase; of these, ambulatory psychotherapy (≥ 30 min) increased dramatically from FY2012.

[Insert figure 1 about here]

At the prefectural level, from FY2010 to FY2015, patients receiving CBT per 100,000 population decreased (or remained at zero) in 32 of 47 prefectures, whereas patients receiving ambulatory psychotherapy per 100,000 population increased in all prefectures. Figure 2 shows the SCR for the number of patients who received each psychotherapy in the study period. There was a maximum 424.7-fold difference in SCR between the highest (SCR = 585.2 in Ishikawa) and lowest (SCR = 1.4 in Tokushima)

prefectures. Meanwhile, there was a maximum 3.4-fold difference in SCR of ambulatory psychotherapy (see online supplementary table 2).

[Insert figure 2 about here]

In terms of the relationship between regional factors and the provision of CBT, the number of patients who received CBT per 100,000 population was associated significantly with the number of registered CBT institutions per 100,000 population ($p < 0.01$) (table 2). If the number of registered institutions per 100,000 population increased by one, the number of patients increased by 23.1 (standard error = 3.4) patients per 100,000 population. The other factors were not associated with the number of CBT patients per 100,000 population or SCR for CBT (table 2 and 3).

Table 2. Results of ecological analysis on factors associated with number of patients who received CBT per 100,000 population (FY2010–2015)

		Estimate	Standard error	Degree of freedom	T value	p value
Number of registered CBT institutions per 100,000 population	Intercept	-5.0	2.6	46	-1.9	0.06
	Slope	23.1	3.4	137	6.7	< 0.01*
Number of psychiatrists	Intercept	4.4	5.9	46	0.7	0.46

per 100,000 population	Slope	0.3	0.4	91	0.6	0.52

* indicates significant difference.

CBT, cognitive behavioral therapy; FY, fiscal year.

Table 3. Association between implementation of formal CBT training and SCR for CBT (FY2010–2015)

	Training [-]	Training [+]	p value
Prefectures (n)	37	10	-
SCR for CBT (Mean ± SE)	98.0 ± 23.0	73.2 ± 19.9	0.59

Degree of freedom = 45, t value = 0.54.

CBT, cognitive behavioral therapy; SCR, standardized claim ratio; FY, fiscal year; SE, standard error.

DISCUSSION

This is the first study to use the nationwide claim database to demonstrate in detail the provision status of CBT in Japan in the first six years (FY2010–2015) after its inclusion in the national health insurance scheme. Our results show that: (a) approximately 60,000 patients received CBT during the study period; (b) the number of patients receiving CBT was highest in the first year (-1.8% from FY2010 to FY2015); (c) the

number of patients receiving CBT per 100,000 decreased (or remained at zero) in most prefectures (32 out of 47); (d) based on SCR, there was a maximum 420-fold regional difference in the number of CBT patients between prefectures; (e) the number of registered CBT institutions was significantly associated with the number of patients receiving CBT. Overall, the current study indicates that the provision of CBT did not increase under Japan's health insurance scheme from FY2010 to FY2015.

The reasons that the provision of CBT reached a plateau in Japan could be due to strict requirements and low medical fees for therapists/institutions in the national health insurance system. For example, a CBT provider must be a medical doctor, must target only outpatients with mood disorder, and the provider's institution must be registered to the Regional Bureau of Health and Welfare of Japan (table 1). In terms of medical fees, CBT fees in Japan are substantially lower than those in Western countries. For example, in Japan, maximum fee for CBT is 5,000 Japanese yen (JPY) per session (equal to 33 Great Britain pounds [GBP], exchange rate: 1 GBP = 150 JPY), whereas the fee in England is 97 GBP (equal to 14,550 JPY) per session.[35] Moreover, CBT fees are almost the same as ambulatory psychotherapy fees for sessions over 30 minutes despite the aforementioned restrictions (table 1). Thus, ambulatory psychotherapy sessions under 30 minutes yield the highest profits for medical doctors in Japan's

national health insurance system. Indeed, Japanese psychiatrists see 7 outpatients per hour in routine clinical practice.[34] Furthermore, some studies have reported that the main obstacles in providing psychotherapy/CBT in Japan are a lack of time and profitability.[29, 30] Thus, more reasonable medical fees and requirements suitable to the actual conditions of routine clinical practice could motivate the use of CBT under the national health insurance scheme in Japan. Although we focused mainly on outpatient settings here, CBT for inpatients should also be included in the national health insurance scheme because it is recommended for inpatients with some disorders as well as in many international guidelines.

This study focused on CBT but a large shift in ambulatory psychotherapy (≥ 30 min) in FY2012 should be addressed. It seems that this large shift was caused by the revision of medical fee requirements for ambulatory psychotherapy in that year. Before the revision in FY2012, psychiatrists at any psychiatric institution were able to claim one type of ambulatory psychotherapy when they spent more than 60 minutes with a patient for the first visit. However, the revision imposed cooperation with local psychiatric emergency medical services (e.g. holiday/night medical examinations) on psychiatrists for this type of ambulatory psychotherapy. Because of this, many psychiatrists (especially those working at small psychiatric institutions) were no longer

able to claim the optional fees for ambulatory psychotherapy applied on the first visit. As a result, it is possible that psychiatrists started claiming outpatients in the first visit as covered by "ambulatory psychotherapy (≥ 30 min)".

Our results also showed a maximum approximately 420-fold difference in SCR for CBT between prefectures, so there was a large regional variation in CBT utilization. In particular, SCR was low over the whole Tohoku region where effective treatment for psychiatric disorders is in high demand because of the high suicide rate.[36] On the other hand, one of the reasons for the large variation in SCR between prefectures may be that the total number of CBT patients in Japan is small. Therefore, if a single institution in a particular prefecture has many CBT patients, the SCR in that area would be overestimated because it is an indicator calculated from the national mean.

During the study period, formal CBT training had been implemented in 10 out of 47 prefectures. We predicted that the implementation of formal CBT training would be associated with SCR for CBT, but there was no association between these variables. The training consists of a two-day onsite workshop and continuous online clinical supervision. Thus, one of the reasons that medical doctors in regions with no workshop training can continue to provide CBT may be because they can receive continuous online supervised instruction irrespective of area. There was also a significant

association between the number of CBT patients per 100,000 population and the number of registered CBT institutions per 100,000 population. These results suggest that an increase in institutions that have formally-trained medical doctors and that meet institutional criteria for CBT could lead to a wide-scale dissemination of CBT under the national health insurance scheme.

To make CBT much more widely available, recent success in England also offers lessons that are likely applicable to Japan. In England, the number of patients with depression finishing CBT increased by 181.2% from FY2013 to FY2018 (28,814 patients to 81,038 patients).[37] One of the reasons for this success could be an increase in the number of therapists through a government-funded one-year systematic training, IAPT (over new 7,000 therapists have trained in FY2015[38]). The NHS has instigated this initiative based on data including economic evaluation in demonstration sites.[39] Towards a successful dissemination of CBT, it is necessary to continue accumulating research-based data, advocating and appealing for the required funding and organizational support, and train CBT therapists.[22] Health care policymakers may require data showing that CBT for mental disorders will in fact reduce costs to health care systems in the long-term. Future studies should therefore attempt to demonstrate

the long-term cost-effectiveness of CBT for various mental disorders in Japanese clinical settings.[40]

The strength of this study is that the data source was the NDB, a comprehensive database which covers all electronic claims in Japan's national health insurance system. However, there are also several limitations. First, the NDB does not store medical treatment data for any treatment provided outside the national system (e.g. private counseling). Although CBT for depression in Japan is mainly provided by psychologists in routine care,[41] it is not covered by the national health insurance system. Thus, there is a possibility that more CBT was actually conducted across Japan, even in prefectures with few CBT patients under the health insurance scheme. Second, we selected ambulatory psychotherapy as a reference to CBT because both psychotherapies target only outpatients and both are provided only by a medical doctor. However, this is still not an ideal reference because the provider and target of both psychotherapies are not perfect analogs. Third, our ecological analysis was conducted using specific variables. There could be other factors which affect the provision of CBT. Finally, the observation period in this study is slightly outdated due to a delayed acquisition process for NDB data from the MHLW. However, we believe that the current study still has academic value for the following reasons. First, this is the first

study to demonstrate the status of CBT in Japan using comprehensive public data. Second, our findings would be useful to future researchers/policymakers reviewing the status of CBT in Japan after the observation period of this study. Because of these limitations, further updates on the NDB (FY2016–) and the questionnaire survey of registered CBT institutions are required.

Overall, this study revealed some issues regarding the provision of CBT in Japan in the first six years (FY2010–FY2015) after its coverage in the national health insurance scheme. The number of patients receiving CBT in Japan did not increase probably due to unprofitability for therapists/institutions in Japan's current healthcare insurance system. Further, there were large regional variations in CBT status between the 47 prefectures and a significant association between the number of CBT patients per 100,000 population and the number of registered CBT institutions per 100,000 population. These findings suggest that an appropriate evaluation of medical fees for CBT in clinical settings and supporting hospitals and/or clinics in meeting the institutional criteria for CBT would help in the widespread utilization of CBT in Japan. Further research into the status of CBT in Japan after the observation period of this study (FY2016–) and a questionnaire survey of registered CBT institutions are required to get more detailed information on the dissemination of CBT.

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Patients consent for publication: Not required.

Ethics approval: The study protocol was reviewed and approved by the Ethics Committee of the University of Miyazaki (reference number: O-0017). We also got permission to use a dataset extracted from the NDB (reference number: 1025-1). Written informed consent was waived because all patient records were automatically anonymized prior to storage in NDB (i.e. no one can identify specific patients).

Provenance and peer review: Not commissioned; externally peer reviewed.

Data sharing statement: The data used in this study are from the Ministry of Health, Labour and Welfare (MHLW) in Japan and therefore, users of these data are strictly limited to those who obtain official permission from the MHLW, in accordance with Japanese Article 33 (Provision of Questionnaire Information) of the Statistics Act, by the Statistic Bureau, Ministry of Internal Affairs and Communications. Qualified researchers who would like to request access to the data should contact the Statistics and Information Department of the MHLW. Please refer to the following URL: http://www.mhlw.go.jp/toukei/sonota/chousahyo.html.

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Figure legends:

Figure 1. Trends over time for the number of outpatients who received psychotherapy in Japan.

FY, fiscal year.

Figure 2. Geographical distribution of standardized claim ratio (SCR) for the number of outpatients who received psychotherapy in Japan from fiscal years 2010 to 2015.

The color bar shows a degree of SCR. SCR of 100 indicates the national mean.

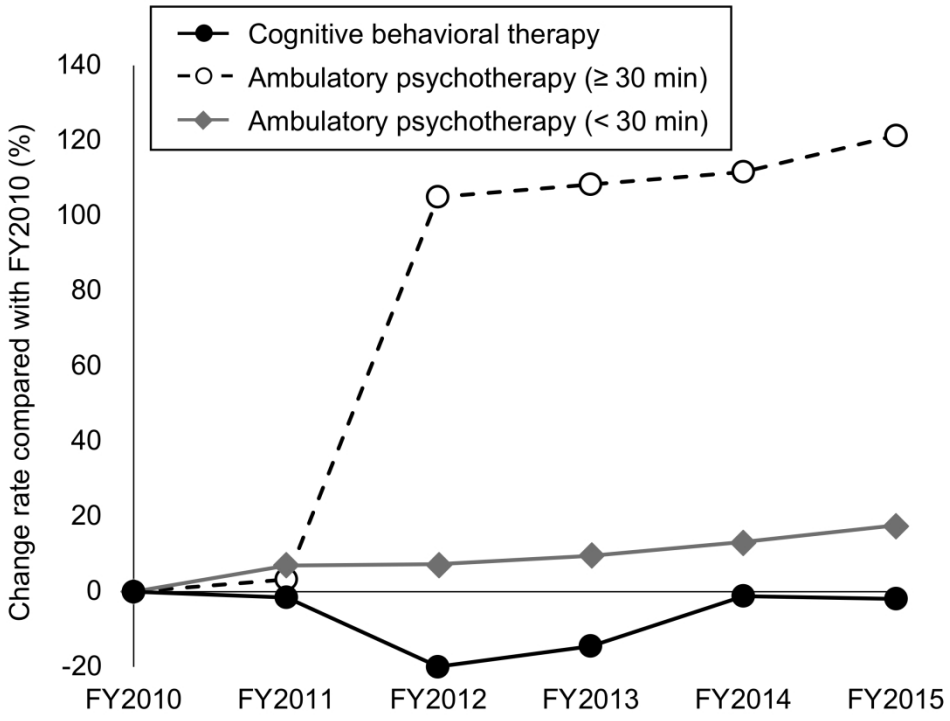

Figure 1. Trends over time for the number of outpatients who received psychotherapy in Japan. FY, fiscal year.

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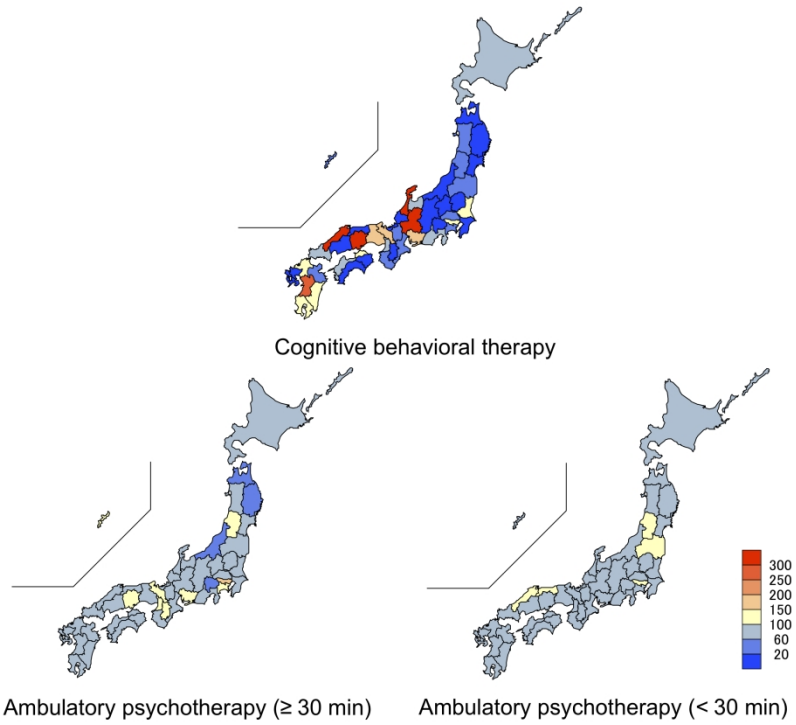
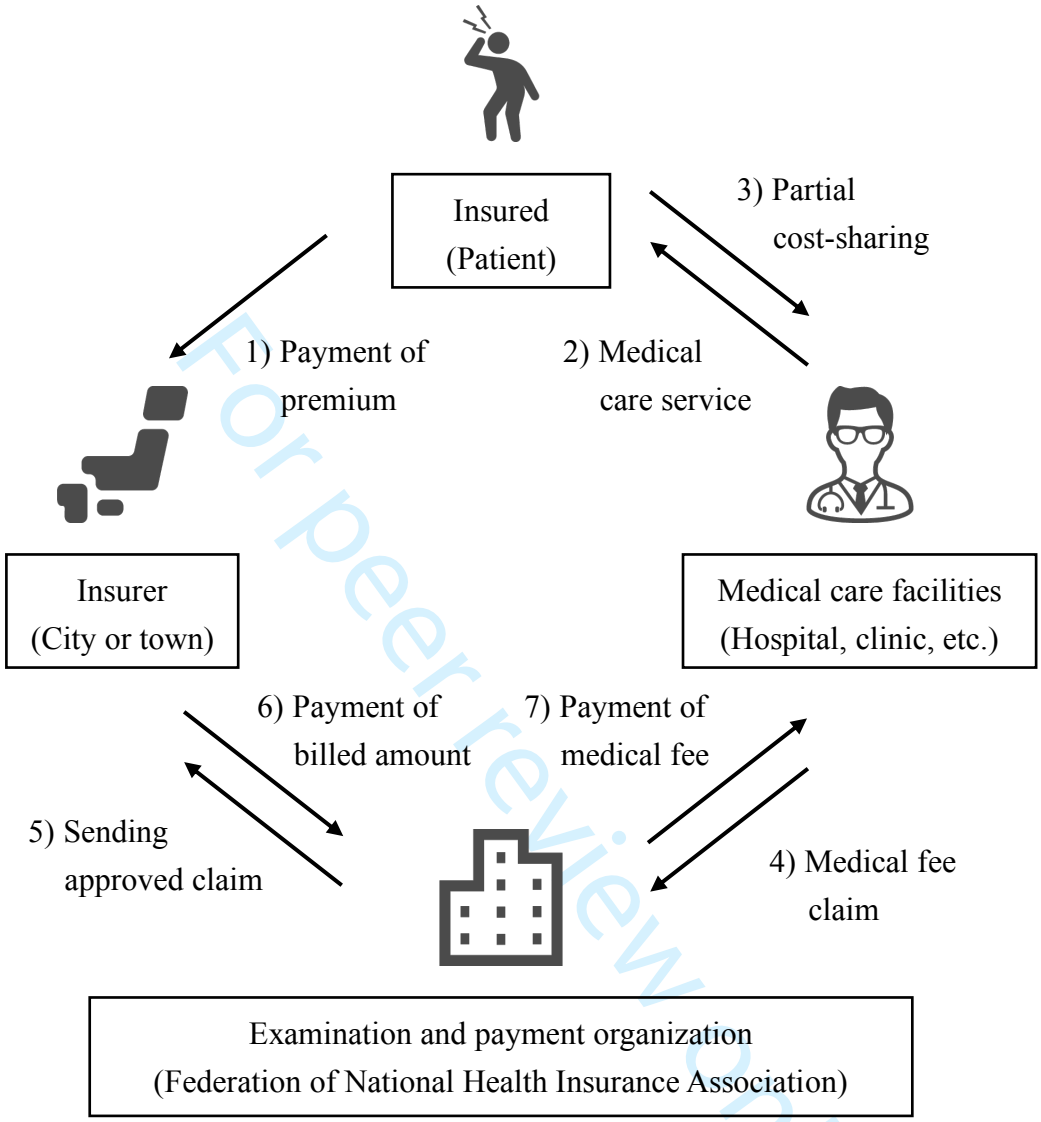


Figure 2. Geographical distribution of standardized claim ratio (SCR) for the number of outpatients who received psychotherapy in Japan from fiscal years 2010 to 2015. The color bar shows a degree of SCR. SCR of 100 indicates the national mean.

254x190mm (300 x 300 DPI)

Supplementary Figure 1. Overview of Japan's universal healthcare system



Supplementary Table 1. Demographic data of outpatients who received each psychotherapies by sex and age groups

	FY2010						FY2011					
	CBT	%	Ambulatory psychotherapy				CBT	%	Ambulatory psychotherapy			
			≥ 30 min	%	< 30 min	%			≥ 30 min	%	< 30 min	%
Male (years)	3,911	34.9	266,900	40.4	1,979,923	42.6	3,896	35.5	279,000	40.8	2,135,354	42.9
0-9	13	0.1	24,510	3.7	34,028	0.7	87	0.8	26,480	3.9	37,825	0.8
10-19	135	1.2	33,955	5.1	85,966	1.9	230	2.1	35,715	5.2	95,109	1.9
20-29	660	5.9	39,449	6.0	231,457	5.0	648	5.9	41,733	6.1	242,586	4.9
30-39	1,027	9.2	52,128	7.9	429,146	9.2	931	8.5	52,961	7.8	447,328	9.0
40-49	900	8.0	43,379	6.6	418,062	9.0	821	7.5	45,867	6.7	457,105	9.2
50-59	451	4.0	25,776	3.9	298,054	6.4	426	3.9	26,776	3.9	321,345	6.5
60-69	304	2.7	18,412	2.8	225,926	4.9	270	2.5	18,563	2.7	252,745	5.1
70-79	233	2.1	17,154	2.6	165,747	3.6	254	2.3	17,855	2.6	180,096	3.6
≥ 80	188	1.7	12,137	1.8	91,537	2.0	229	2.1	13,050	1.9	101,215	2.0
Female (years)	7,285	65.1	393,585	59.6	2,662,976	57.4	7,084	64.5	404,249	59.2	2,839,696	57.1
0-9	-*	-*	8,532	1.3	11,131	0.2	27	0.2	9,415	1.4	12,570	0.3
10-19	240	2.1	35,604	5.4	90,061	1.9	314	2.9	35,701	5.2	92,282	1.9
20-29	1,435	12.8	73,045	11.1	349,509	7.5	1,475	13.4	73,823	10.8	356,484	7.2
30-39	1,821	16.3	82,301	12.5	496,888	10.7	1,684	15.3	82,397	12.1	515,329	10.4
40-49	1,317	11.8	59,671	9.0	432,489	9.3	1,187	10.8	63,124	9.2	471,593	9.5
50-59	745	6.7	37,629	5.7	341,547	7.4	640	5.8	38,391	5.6	360,082	7.2
60-69	596	5.3	33,855	5.1	362,120	7.8	570	5.2	34,571	5.1	400,893	8.1
70-79	607	5.4	34,972	5.3	337,177	7.3	573	5.2	36,171	5.3	363,038	7.3
≧80	524	4.7	27,976	4.2	242,054	5.2	614	5.6	30,656	4.5	267,425	5.4
Total	11,196	100.0	660,485	100.0	4,642,899	100.0	10,980	100.0	683,249	100.0	4,975,050	100.0

	FY2012						FY2013					
	CBT	%	Ambulatory psychotherapy				CBT	%	Ambulatory psychotherapy			
			≥ 30 min	%	< 30 min	%			≥ 30 min	%	< 30 min	%
Male (years)	3,076	34.6	560,242	42.1	2,165,896	43.2	3,335	35.1	569,291	42.0	2,219,842	43.2
0-9	38	0.4	35,832	2.7	42,067	0.8	87	0.9	39,511	2.9	44,852	0.9
10-19	205	2.3	56,679	4.3	101,667	2.0	289	3.0	62,003	4.6	110,685	2.2
20-29	596	6.7	96,743	7.3	241,561	4.8	634	6.7	97,146	7.2	242,685	4.7
30-39	820	9.2	117,335	8.8	434,811	8.7	791	8.3	114,192	8.4	429,615	8.4
40-49	669	7.5	101,404	7.6	472,920	9.4	707	7.4	103,653	7.6	493,436	9.6
50-59	361	4.1	56,336	4.2	324,168	6.5	358	3.8	58,176	4.3	339,876	6.6
60-69	132	1.5	35,539	2.7	249,642	5.0	165	1.7	34,569	2.5	252,337	4.9
70-79	123	1.4	33,967	2.6	184,434	3.7	159	1.7	33,671	2.5	186,195	3.6
≥ 80	132	1.5	26,407	2.0	114,626	2.3	145	1.5	26,370	1.9	120,161	2.3
Female (years)	5,807	65.4	771,408	57.9	2,850,916	56.8	6,168	64.9	786,834	58.0	2,912,985	56.8
0-9	13	0.1	12,801	1.0	13,991	0.3	32	0.3	14,292	1.1	14,791	0.3
10-19	327	3.7	58,361	4.4	90,174	1.8	334	3.5	61,544	4.5	92,688	1.8
20-29	1,341	15.1	152,412	11.4	342,357	6.8	1,331	14.0	153,488	11.3	340,023	6.6
30-39	1,494	16.8	155,592	11.7	497,402	9.9	1,445	15.2	155,481	11.5	496,462	9.7
40-49	1,096	12.3	122,844	9.2	487,840	9.7	1,198	12.6	129,208	9.5	516,329	10.1
50-59	584	6.6	73,272	5.5	358,659	7.1	673	7.1	76,207	5.6	372,409	7.3
60-69	360	4.1	64,996	4.9	391,051	7.8	397	4.2	65,076	4.8	392,264	7.6
70-79	294	3.3	69,522	5.2	367,981	7.3	374	3.9	69,623	5.1	372,923	7.3
≧80	298	3.4	61,608	4.6	301,461	6.0	384	4.0	61,915	4.6	315,096	6.1
Total	8,883	100.0	1,331,650	100.0	5,016,812	100.0	9,503	100.0	1356,125	100.0	5,132,827	100.0

	FY2014						FY2015					
	CBT	%	Ambulatory psychotherapy				CBT	%	Ambulatory psychotherapy			
			≥ 30 min	%	< 30 min	%			≥ 30 min	%	< 30 min	%
Male (years)	3,875	35.3	586,888	42.6	2,300,881	43.5	3,865	35.3	622,021	43.1	2,403,172	43.7
0-9	33	0.3	43,989	3.2	50,390	1.0	40	0.4	47,545	3.3	57,976	1.1
10-19	349	3.2	64,301	4.7	119,572	2.3	413	3.8	71,046	4.9	134,036	2.4
20-29	689	6.3	99,072	7.2	248,292	4.7	781	7.1	106,333	7.4	260,323	4.7
30-39	963	8.8	113,575	8.2	427,762	8.1	894	8.2	115,858	8.0	427,604	7.8
40-49	791	7.2	107,432	7.8	517,169	9.8	757	6.9	112,828	7.8	539,896	9.8
50-59	458	4.2	61,797	4.5	361,529	6.8	427	3.9	67,209	4.7	386,159	7.0
60-69	206	1.9	35,107	2.5	258,163	4.9	224	2.0	36,744	2.5	267,293	4.9
70-79	202	1.8	33,992	2.5	191,525	3.6	194	1.8	35,160	2.4	195,045	3.6
≥ 80	184	1.7	27,623	2.0	126,479	2.4	135	1.2	29,298	2.0	134,840	2.5
Female (years)	7,095	64.7	791,424	57.4	2,992,615	56.5	7,077	64.7	819,723	56.9	3,090,963	56.3
0-9	21	0.2	15,395	1.1	16,580	0.3	25	0.2	16,761	1.2	18,807	0.3
10-19	427	3.9	61,191	4.4	95,814	1.8	499	4.6	67,150	4.7	103,448	1.9
20-29	1,390	12.7	150,502	10.9	338,609	6.4	1,398	12.8	154,718	10.7	344,264	6.3
30-39	1,568	14.3	152,600	11.1	494,340	9.3	1,533	14.0	152,159	10.6	494,355	9.0
40-49	1,528	13.9	133,540	9.7	545,860	10.3	1,636	15.0	139,034	9.6	573,414	10.4
50-59	779	7.1	79,907	5.8	393,351	7.4	830	7.6	85,473	5.9	416,398	7.6
60-69	432	3.9	63,576	4.6	394,986	7.5	373	3.4	65,256	4.5	400,465	7.3
70-79	467	4.3	70,617	5.1	383,780	7.3	399	3.6	71,180	4.9	389,717	7.1
≧80	483	4.4	64,096	4.7	329,295	6.2	384	3.5	67,992	4.7	350,095	6.4
Total	10,970	100.0	1,378,312	100.0	5,293,496	100.0	10,942	100.0	1,441,744	100.0	5,494,135	100.0

*Number of patients less than 10 people were noted as zero (-) in order to prevent unwanted identification of personal information.

Abbreviation: CBT, cognitive behavioral therapy; FY, fiscal year.

Supplementary Table 2. Standardized claim ratio of outpatients who received each psychotherapies by prefecture

Prefecture	CBT	Ambulatory psychotherapy	
		≥ 30 min	< 30 min
Japan	reference*	reference*	reference*
Hokkaido	63.8	74.5	94.7
Aomori	8.7	51.7	82.1
Iwate	8.6	57.8	88.5
Miyagi	19.7	97.5	88.3
Akita	29.0	99.4	90.3
Yamagata	51.8	118.3	106.3
Fukushima	29.7	89.0	102.6
Ibaraki	138.9	60.7	71.4
Tochigi	13.9	60.7	85.0
Gunma	18.9	98.0	91.7
Saitama	42.9	68.8	77.1
Chiba	15.5	73.0	87.6
Tokyo	144.2	176.2	118.7
Kanagawa	47.8	108.2	92.2
Niigata	11.3	57.3	96.0
Toyama	60.5	66.4	85.8
Ishikawa	585.2	71.1	89.2
Fukui	1.9	81.3	97.6
Yamanashi	14.6	57.4	71.8
Nagano	5.7	95.2	97.2
Gifu	388.0	86.9	78.9
Shizuoka	75.1	70.1	83.1
Aichi	153.5	116.7	88.3
Mie	56.2	94.9	87.8
Shiga	54.6	78.6	80.2
Kyoto	193.6	118.1	82.8
Osaka	97.9	103.9	89.3
Hyogo	173.8	90.2	89.4
Nara	5.5	100.0	80.3
Wakayama	32.9	80.3	83.5
Tottori	18.4	69.1	100.3
Shimane	483.8	84.2	117.6
Okayama	352.9	117.2	97.3

Hiroshima	18.9	82.3	94.4
Yamaguchi	61.6	84.8	93.5
Tokushima	1.4	90.2	89.4
Kagawa	115.2	88.4	86.7
Ehime	78.9	74.3	96.0
Kochi	3.2	80.0	90.9
Fukuoka	115.0	97.7	81.8
Saga	1.8	76.3	80.0
Nagasaki	5.5	81.2	91.4
Kumamoto	251.2	90.9	84.9
Oita	43.4	80.7	83.5
Miyazaki	118.6	90.7	84.0
Kagoshima	103.4	79.7	75.3
Okinawa	40.4	137.3	93.4

*Standardized claim ratio of 100 indicates national mean (reference).

Abbreviation: CBT, cognitive behavioral therapy.

STROBE 2007 (v4) checklist of items to be included in reports of observational studies in epidemiology*

Checklist for cohort, case-control, and cross-sectional studies (combined)

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	Title page
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	P1–2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	P3–5
Objectives	3	State specific objectives, including any pre-specified hypotheses	P5
Methods			
Study design	4	Present key elements of study design early in the paper	P6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	P6–7
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	N/A
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	N/A
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	P6–10
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	P6–10
Bias	9	Describe any efforts to address potential sources of bias	N/A
Study size	10	Explain how the study size was arrived at	N/A
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	P9–10
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	P9–10
		(*b*) Describe any methods used to examine subgroups and interactions	N/A
		(*c*) Explain how missing data were addressed	N/A
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed	N/A

		Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy	
		(*e*) Describe any sensitivity analyses	N/A
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	P11
		(b) Give reasons for non-participation at each stage	N/A
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	P11
		(b) Indicate number of participants with missing data for each variable of interest	N/A
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	N/A
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	N/A
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	N/A
		Cross-sectional study—Report numbers of outcome events or summary measures	N/A
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	P11–13
		(*b*) Report category boundaries when continuous variables were categorized	N/A
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	N/A
Discussion			
Key results	18	Summarise key results with reference to study objectives	P13–14
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	P18–19
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	P13–19
Generalisability	21	Discuss the generalisability (external validity) of the study results	P18
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	P20

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.
Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.